TOOLING & PRODUCTION

Magazine

JULY 1959

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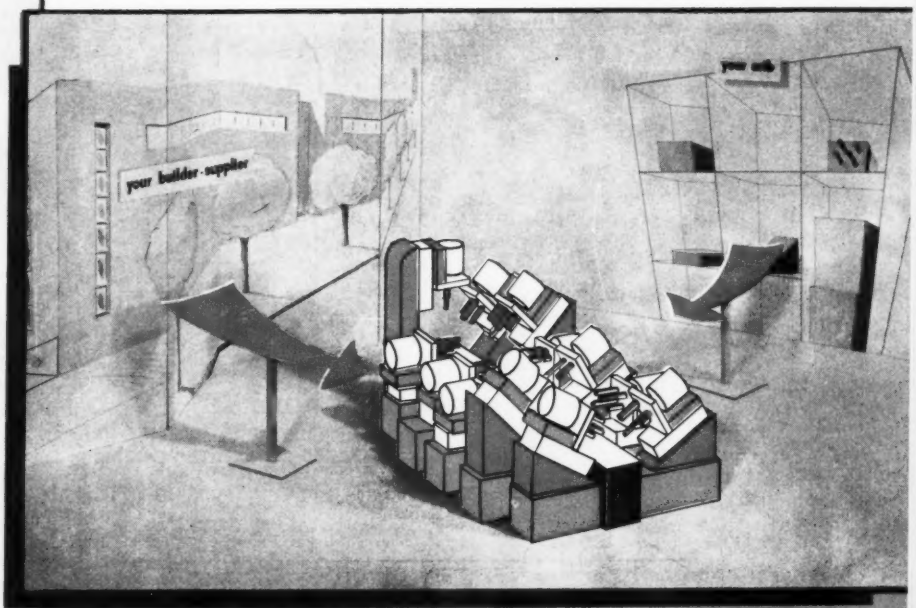

INDUSTRY AGREES ON 'BUILDING BLOCK' STANDARDS – page 35

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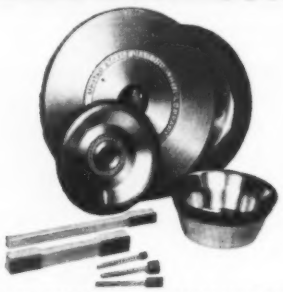

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CIRCLE INFORM-A-GRAM KEY NO. 4

TOOLING & PRODUCTION Magazine

JULY 1959
VOL. XXV No. 4
GEORGE J. HUEBNER, Founder
1885 - 1956

PERSONALLY SPEAKING

Dear T & P Reader:

Human progress has been directly paced by standardization. It certainly is easy to think of many examples of the correctness of that statement. The basic necessity for standardization, of course, is a matter of economics. It's all tied up with the necessarily never ending improvement in our standard of living.

Now a new form of standardization has been developed for metalworking plants. The first agreed specifications are in this issue in an article entitled "Industry Agrees on 'Building Block' Standards." These new standards, when finalized, are for components which, when combined, can provide a variety of capabilities and capacities for various production machining operations.

Like any other step in the progress of the human race, there is opposition to this new program of standardization. We believe, however, that extension of this new form of standardization is as inevitable as was the use of production-made twist drills in place of continuing the use of drills that people twisted themselves.

Within this century, of course, we've had an endless succession of new standards that have paced progress. We certainly hope that this trend will continue because we firmly believe that if it were to stop, progress itself would come to an abrupt end.

We highly recommend that you read "Industry Agrees on 'Building Block' Standards" and that you give consideration to use of the new standards for improvement of your production operations.

Cordially yours,

Ray Huebner

Publisher

READERSHIP RESEARCH — BPA

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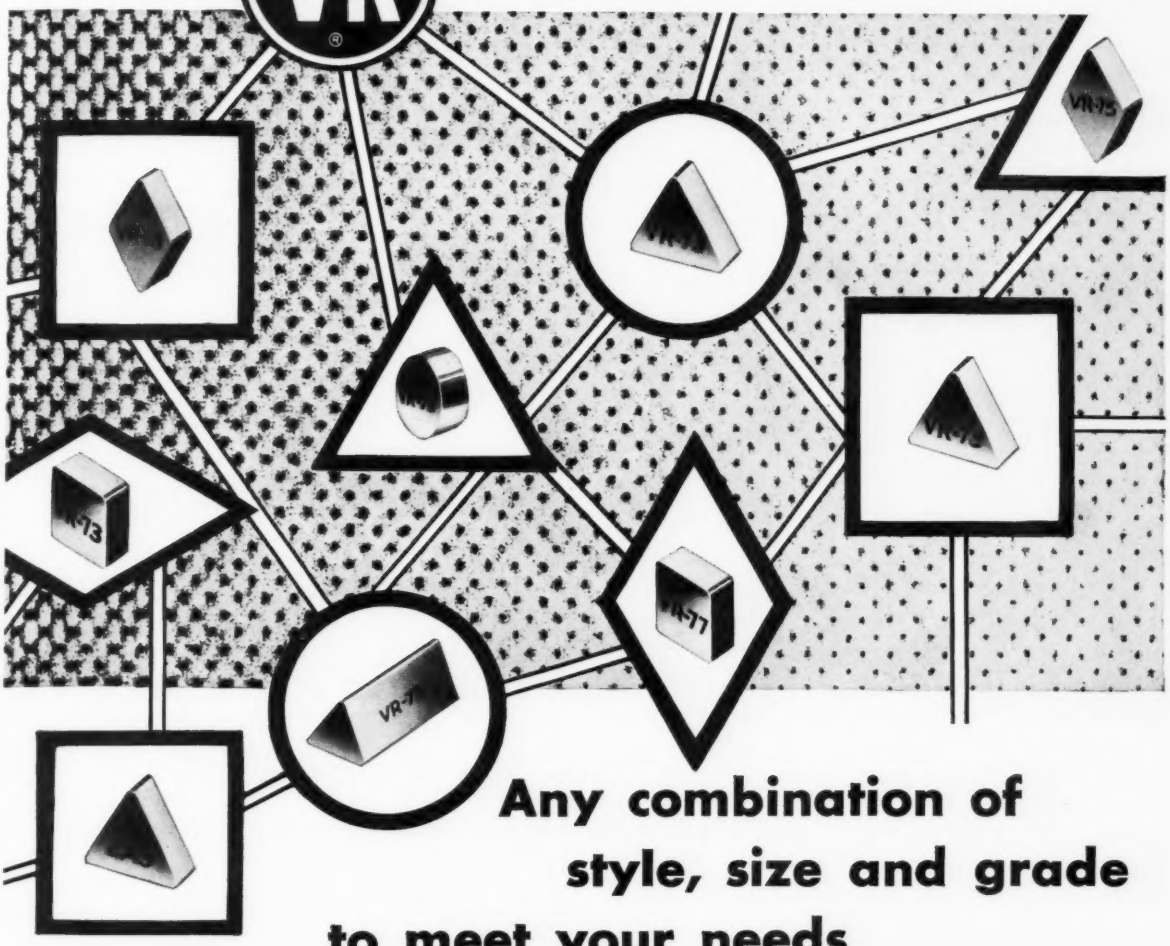
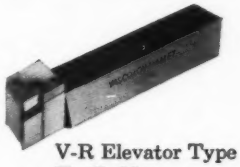


Any combination of style, size and grade to meet your needs



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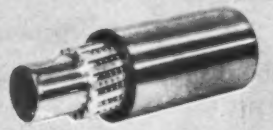
Here are seven reasons why...



- Negative clearance means longer die life. No die shifting. Misalignment is eliminated.
- Ball bearing construction speeds assembly and disassembly. Yet installation is conventional. Die builder doesn't work in reverse.
- Smooth even preloading prevents shock...assures alignment of punch and die. Off-set design reduces wear.
- Easy oiling and maintenance. Loosen the set screw, the retainer is out and back in minutes.
- Eliminates downtime caused by seized pins and bushings.
- Standard components—no need to stock or wait for specials.
- Existing sets can be easily and economically converted to Bliss-Dieco ball bearing design.

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Note: Bliss-Dieco ball bearing assembly can be stripped from guide post on inclinable or straight side presses.

Bliss' patented ball bearing die set has money and time saving advantages no other die set has—conventional or otherwise. It gives you more burr-free parts between regrinds... fewer rejects.

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Pre-loaded ball bearings provide *negative clearance* for perfect die register, even after millions of hits.

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In short, with the Bliss ball bearing die set you get maximum die life—"cleaner" parts—fewer die breakdowns. For further information, write E. W. Bliss Company, Die Supply Division, 1400 Brookpark Road, Cleveland, Ohio. We'll be glad to send you an illustrated technical bulletin that will tell you how you can have ball bearing die sets at a surprisingly low cost or how you can convert your existing die sets to the new Bliss-Dieco design.

dieco DIE SETS

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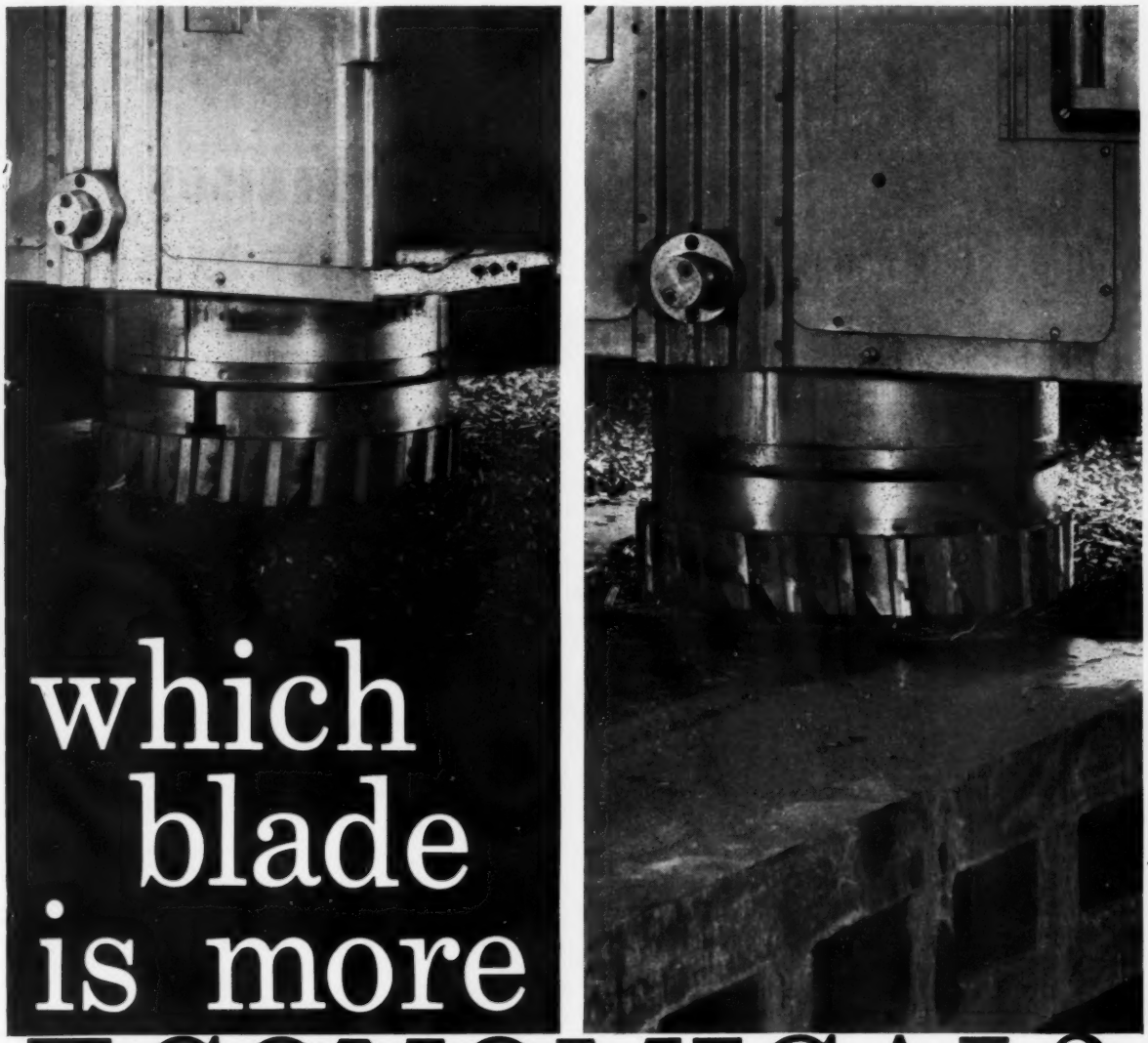
Cleveland, Ohio

CIRCLE INFORM-A-GRAM KEY NO. 6

high speed steel or carbide...



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...scrap virtually eliminated by precise control of density obtained hydraulically

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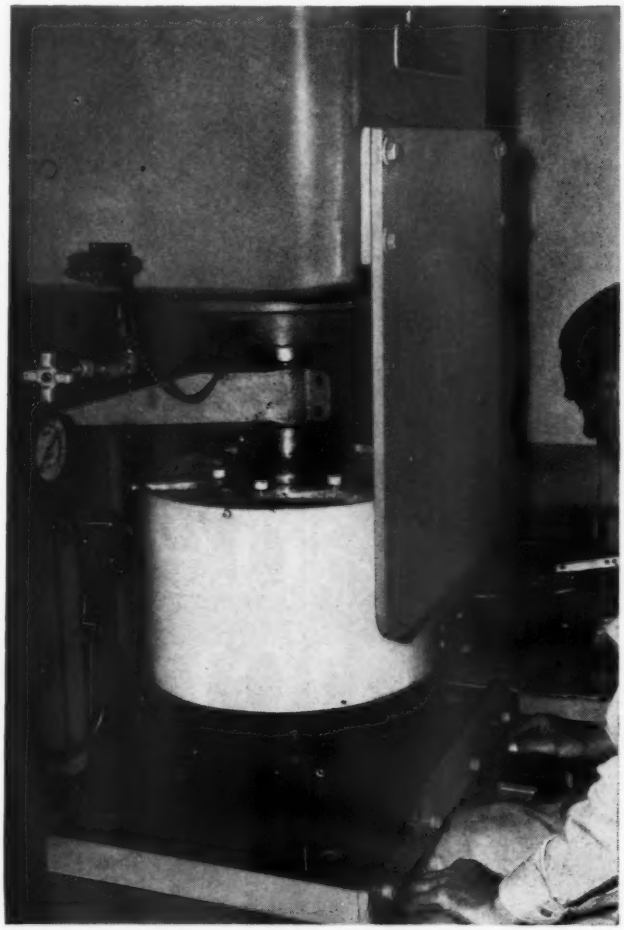
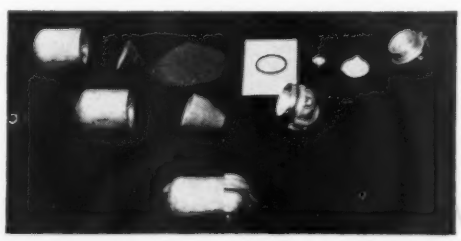
In the production of the shaped charge assembly, a precise amount of explosive is automatically weighed out, placed in a container and loaded in a die. With one, smooth stroke of the hydraulic ram, the charge is compacted to exact density. This density is duplicated from charge-to-charge because the ram will not reverse until its preset pressure is reached.

Production runs in excess of 2,000 assemblies-per-day for Multipress with a minimum of operator training.

Whatever your compacting job or assembly operation may be, savings like these could be duplicated in your plant. Ask the Denison Specialist to show you how. And write today for a descriptive catalog on the complete Multipress line.



300% increase *in production of compacted powders is attained with Denison hydraulic Multipress at Jet Research Center, Inc., Arlington, Texas.*



Components for assembly *of shaped charges used in perforating oil and gas wells.*

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CIRCLE INFORM-A-GRAM KEY NO. 8

★ ★ ★ ★ ★ ★ ★

Conference Report

★ ★ ★ ★ ★ ★ ★

NUMERICAL CONTROL IN INDUSTRY

TEN YEARS AGO THIS MONTH the first of many successively outstanding steps was taken in the attempt to control machine motions with numerical data and tapes and cards. Parsons Corp., under Air Materiel Command contract, subcontracted control system research to the Servomechanisms Lab of Massachusetts Institute of Technology. The resulting first application came in 1952, when MIT introduced a numerically controlled milling machine.

Since that time many innovations and improvements have been born of the continuing and cooperative efforts of MIT and many other organizations. And, many users have begun to reap the profits of numerically controlled operations. Earlier this year, for example, MIT, the Air Materiel Command, and the Aircraft Industries Association revealed the latest APT (automatically programmed tools) system, whereby English-like words are fed to computers and there translated to directions for the machine tool to follow.

Although the aircraft manufacturers lead the NC parade, others are and should be vitally interested in it. Proof of this was evident at the recent three-day numerical control conference at Purdue University. Attendees ranged from machine tool and control designers and builders to automotive, appliance, electronic, electrical, and even fastener manufacturers. A similar conference was held a month before at the University of California.

As cooperative with such a mixture of industry representatives as they are among themselves, the aircraft industry's NC leaders, with a number of numerically controlled successes and failures, lead the share-the-knowledge sessions.

Get Facts, Plot Course

One of their first suggestions to potential users is that Engineering get all the details available on NC, and how and where they can use it, and keep their top management appraised of this. Only with sufficient information can top management approve, or even consider, the expenditures for the acquisition of equipment. Such preliminary "legwork" was evident at the Purdue sessions, where planners, designers, and tool engineers questioned users thoroughly as to the various types of equipment, computer requirements, possible applications, advantages, limitations, and costs. Some managements sent technically-trained representatives to the conference with specific instructions to gather basic information and begin planning use possibilities when they returned to home base.

The advantages of numerical control — shortened lead-, tooling-, machining-, and inspection times, flexibility, and accuracy, to name a few — have been reported many times. The limitations, such as its sometimes high initial cost, maintenance requirements, and managerial problems, can be minimized when NC is introduced into a company that has prepared itself adequately.

...Continued on page 12

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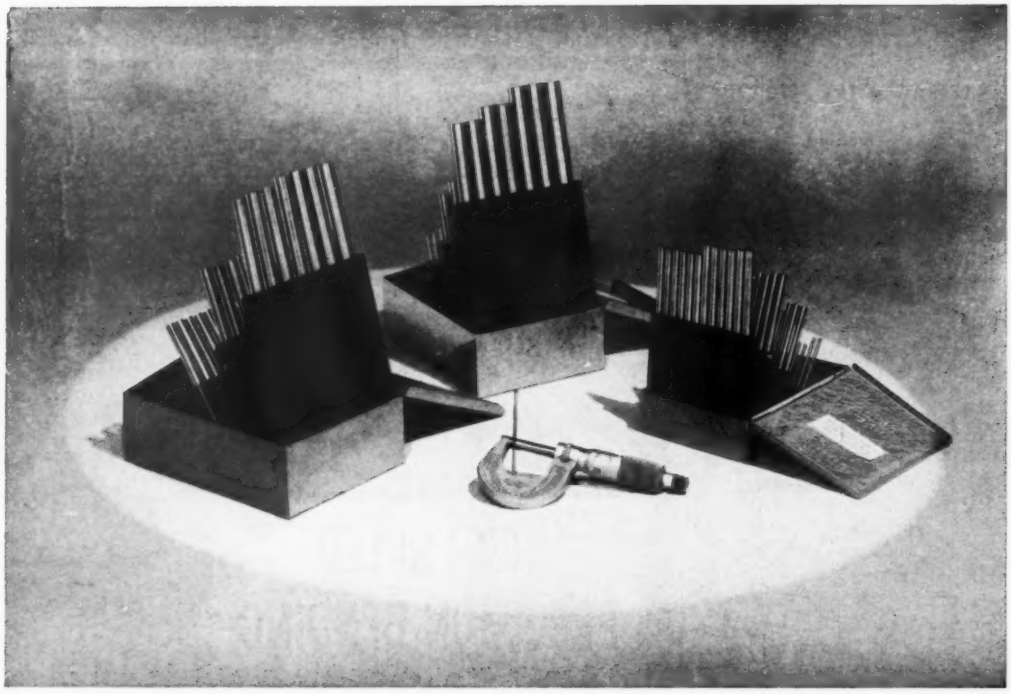

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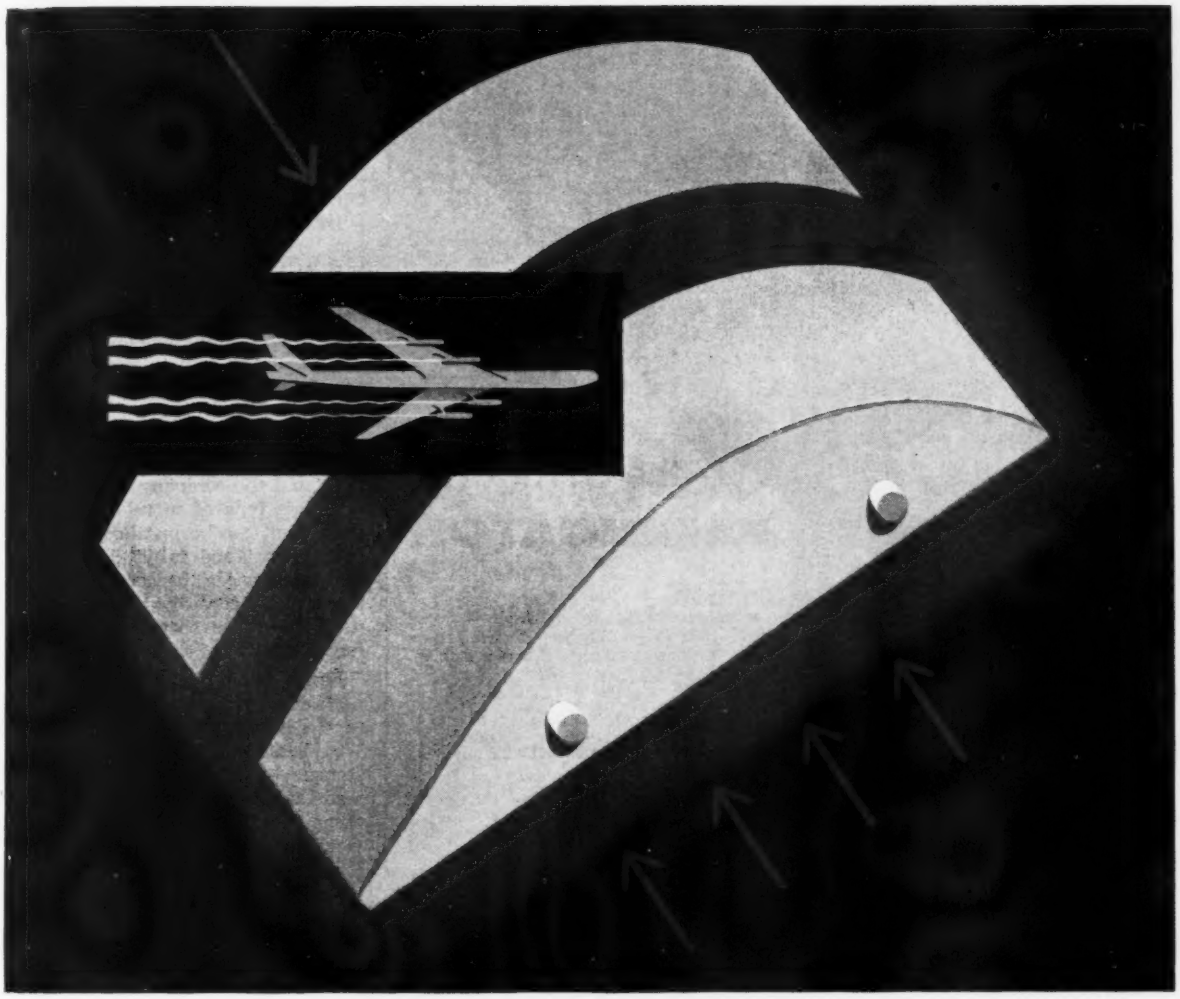

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CIRCLE INFORM-A-GRAM KEY NO. 12

...Report from page 9

Many Jobs Now for Numerical Control

Almost every metalworking plant has a spot that is ready now for numerical control, Thomas Atwater, Jr., vice president of Product Development Corp., pointed out. He spoke first of the many variations of numerically controlled point-to-point positioning setups now available, such as drilling machines and jig borers, that can be used in almost every manufacturing plant. The cost range for such equipment can be very low or high, depending on the basic machine tool selected and the amount of automatic control and accuracy required.

Continuous path control of three or more axes is another story, however, and the company should make sure this type of more complicated equipment can be justified and used fully. The "used fully" is a key to the justification because the more numerically controlled machines are used, the more economical are the individual runs.

Emil Gibian, recently retired Staff director of the Thompson Products Division of Thompson Ramo Wooldridge Inc., told of an instance where numerical control made it possible to design and machine complicated engine parts that would have been out of the question if manufacture had to be by conventional man-controlled machine tools. The blade angles were such that accuracy of any reasonable degree would make the part a design dream rather than a reality without NC.

Die making, handled with numerically controlled machines by a number of aircraft companies now, is another job numerical control can take over economically. Although the initial cost is high, die shops can get a good return on their investment by being able to design and produce dies faster and, in many cases, cheaper.

Delivery is a big thing for job shops, as conference speakers pointed out time and time again. Aircraft manufacturers, in fact are looking for job shops that can handle the tapes they've prepared as part of the initial design of parts for use in advanced aircraft. Once the production data is plotted with the aid of their computer centers, it's a relatively simple job to take their tapes and run the parts — if the job shop has the numerically controlled machines. Unless the job shop prepares itself to take on such operations, they will be losing a healthy chunk

...Continued on page 16

CIRCLE INFORM-A-GRAM KEY NO. 13→

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Utilizes the Full Potential of Modern Rotating Gun Drills.

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Ability to Precision Drill Odd Shaped Pieces.

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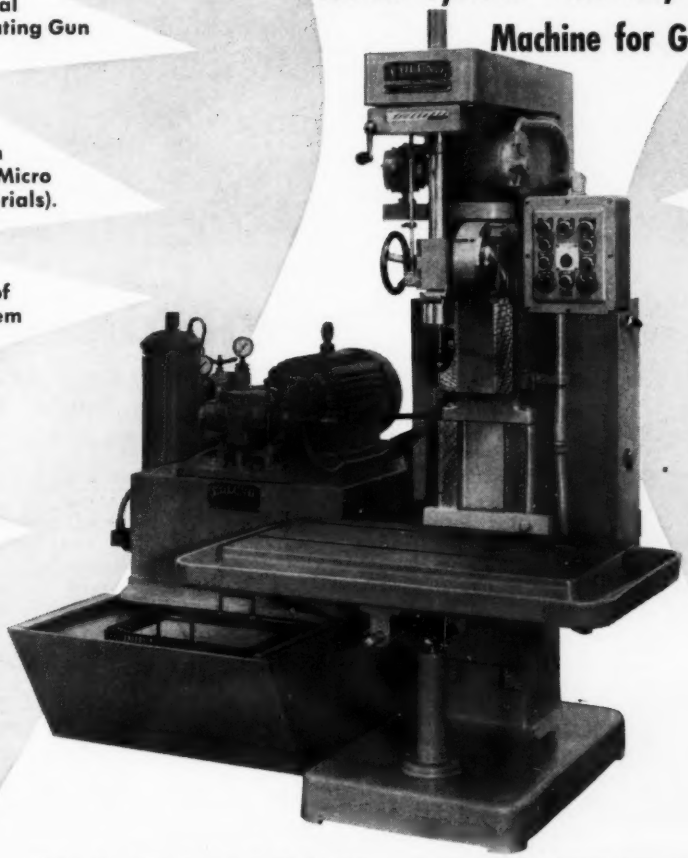
Gun Drilling Machine Model 2G and High Pressure Coolant System — The only Vertical Gun Drilling Machine for General Purpose Work.



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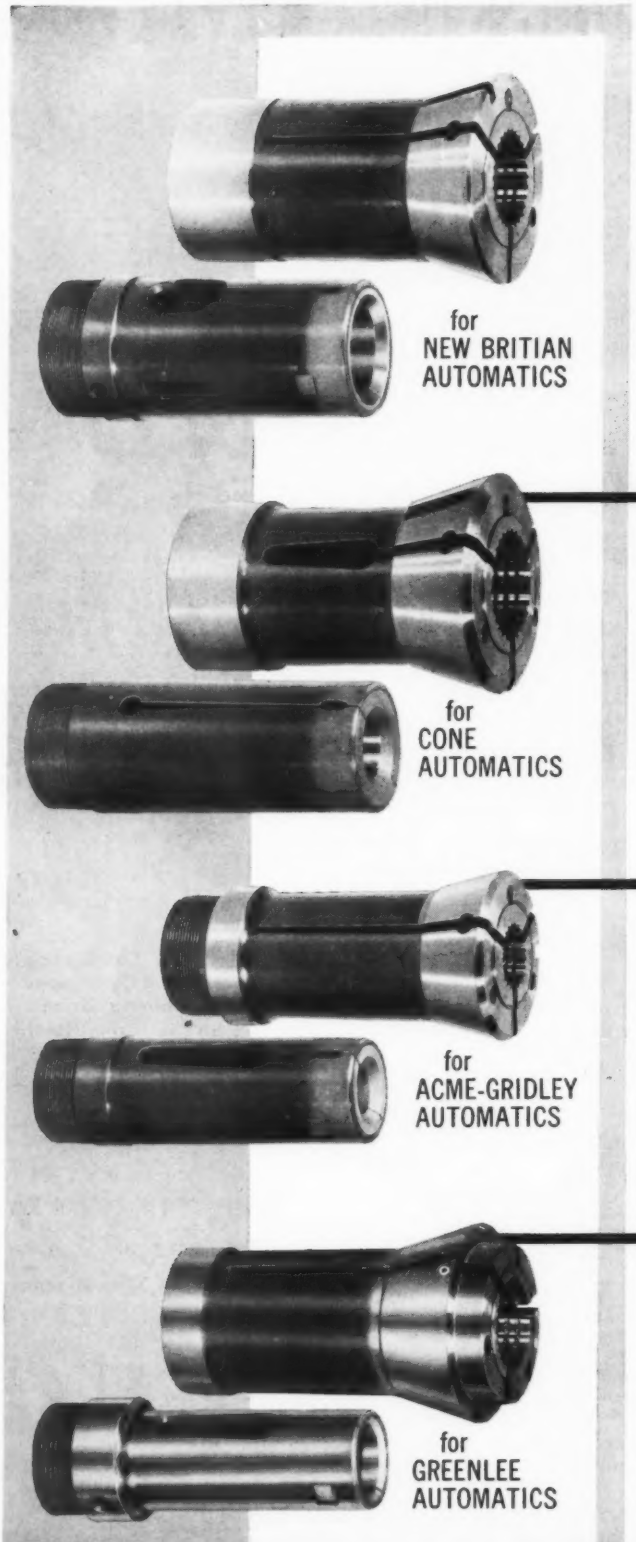

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are the only masters
with no work pressure on the screw . . .

Hardinge Style "B" Master Feed Fingers
save from 30% to 80%
over conventional solid feed fingers.

Also
Master Feed Fingers and Pads
for Brown & Sharpe, Cleveland
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HARDINGE BROTHERS, INC., ELMIRA, N. Y.

PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE

Immediate stock delivery from Elmira, Boston, Atlanta, New York, Hartford, Philadelphia, Rochester, N. Y., Dayton, Detroit, Minneapolis, Chicago, St. Louis, Oakland, Los Angeles, Toronto, Montreal.

CIRCLE INFORM-A-GRAM KEY NO. 14

Simple...Positive...Faster...Accurate Indexing with TRIG-R-DEX

Trig-R-Dex is a completely new concept in manual indexing that simplifies and speeds straight or spiral operations.

To index—simply grasp the Trig-R-Dex handle, push down on the trigger button and move the handle until index pin engages the next hole, pull handle to stop position and you have indexed one increment. During work processing operations, the Trig-R-Dex handle always remains stationary. But, the index plate is keyed to the driver holding the work center . . . this assures the index plate, center and workpiece turn as a unit.

By selecting proper index plate, both right- and left-hand operations having from one to ten spaces can be accurately indexed. Changing from one index plate to another is extremely easy and takes but a couple minutes.

Because Trig-R-Dex is simple in design, of rugged construction, easy to operate and precision made, it will give years of accurate, trouble-free service while reducing costs and boosting your production.

For further information, write to:

U.S. PATENT NO. 2,711,324

DETROIT REAMER & TOOL COMPANY

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Only WESPO can supply ALL these
WORK HOLDING DEVICES

TOGGLE CLAMPS and PLIERS 80 Types & Sizes
ASTE DATA SHEETS
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BASE MOUNTED SWING CLAMP NEW
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CIRCLE INFORM-A-GRAM KEY NO. 16

... Report from page 12

of business to the companies that are prepared to handle it.

Some Suggestions

A few qualifying remarks by the NC-experienced speakers should be reviewed by firms contemplating numerical control: Many companies, they said, are not ready for numerical control because they do not have control over present production. They need methods standardization. Entering numerical control with the same conditions will be expensive and foolhardy. All departments involved must have their methods worked out and be ready for cooperation unlike any before ever attempted, if numerical control is to be economically succeessful.

As a rough criterion, Atwater suggests that any company doing $100,000 worth of business a year should consider numerical control, as should those doing non-repetitive or short run work. If continuous path control is what's needed, start with a general purpose machine tool, he adds, and a 3-axis control setup.

For many continuous path operations, a complex computer and full staff of computer experts are not necessary. Computer centers, some run by the equipment manufacturers, are being established in major industrial cities, and it is far cheaper to subcontract such work than to invest in the equipment and use it only part time. If the company is large enough to be able to use computer facilities for many other departments, the computations for the more complex production operations can well be handled within the company's walls.

What kind of thinking does management need for this shift to numerical control? Harry Cooper, Convair Aircraft Co. project engineer, says top management has to make sure their operational staffs are thoroughly informed and are technically equipped to handle this new technique. Atwater went so far as to say that when considering a continuous path setup, with computer calculation a necessary part of it, tentatively set aside again as much as the whole outfit cost to be used to do research and development work with it. That figure may sound out of proportion for many companies, he added, but much of it can be written off as R&D.

Departmental Duties Anticipated

Cooper continued with the idea that the plant's various departments will have new skills to learn, and they must be coordinated. Engineer-

... Continued on page 18

save tooling dollars

with this versatile, quick set-up

DUMORE®

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Complete tool, ready to operate —includes reversing motor, electric tap control, pulleys, chuck.

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Your Key to all-purpose machining—**anywhere.** It permits fast, easy mounting in any position, angle or direction in single set-ups, or multiple operations in sequence.

You can save hundreds of dollars in first cost alone with these DUMORE AUTOMATIC DRILL UNITS

SERIES 24 DRILL UNIT
Fully automatic with all controls built-in for short or long runs and frequent changeovers. From $613*

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Same as Series 24 with just basic controls built-in for long, uninterrupted runs. From $505.50*

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Built-in adjustable controls—automatically selects proper speeds/feeds. No. 80 to 5/32" drill capacity. From $217.50*

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Plug it in and it's ready to go

—Any unskilled laborer can learn to operate it in minutes. Once set, it's always set — minimizes scrap loss, drill breakage and eliminates operator fatigue slowdowns. Changes easily, quickly from job to job, operation to operation, for long or short runs. Precision engineering, famous Dumore quality workmanship and separate, isolated hydraulic and pneumatic systems provide trouble-free service over millions of cycles. Less than one cubic inch of air required . . . a cost-cutting feature.

The Dumore Series 28 "Drill-N-Tap" Unit

can be a drilling or tapping machine with just the flip of a selection switch. Tap fits into chuck, no extra attachments required. Reversing motor controls tap, eliminates troublesome clutches. Adjustable, positive spindle speeds from 265 to 4900 rpm. Can be set up for operation in 5 minutes—on drill press or special machine, with simple nose bracket. *For more details, send coupon.*

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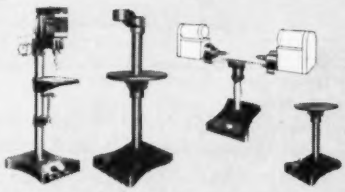
MULTIPLE SPINDLE ATTACHMENT fits units 28, 24, 26. For simultaneous drilling or tapping of 2, 3 or 4 holes. Quickly adjustable center distances.



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Includes Circular and Rectangular Fixture Presses, Cross Arm Bar Assemblies, Circular Production Tables, Variety of Brackets, Control Components and other units to provide complete parts needed for building your own single or multi-purpose drilling or tapping machines for lower cost production.

AND THESE HANDY, USEFUL TOOLS

DRILL GRINDER, resharpens and precision points drills up to ¼".

MICRO-DRILL for drilling holes as small as .0001" diameter, without skilled operators.

HI-SPEED DRILL PRESS, hand operated, bench type, 0-⅛" capacity. And, DRILL SPEEDER, right, fits standard drill press, 17,000 rpm. 0-⅛" capacity.

Sold and Serviced Thru Leading Industrial Distributors Everywhere

You Can Do More with DUMORE®

ALL PURPOSE PRECISION METALWORKING TOOLS

VERSA-MIL • DRILL-N-TAP UNITS DRILLING UNITS • DRILL HEADS MICRO-DRILLS • DRILL GRINDERS PRECISION GRINDERS • HAND GRINDERS • FLEX-SHAFT TOOLS • QUILLS AND ACCESSORIES

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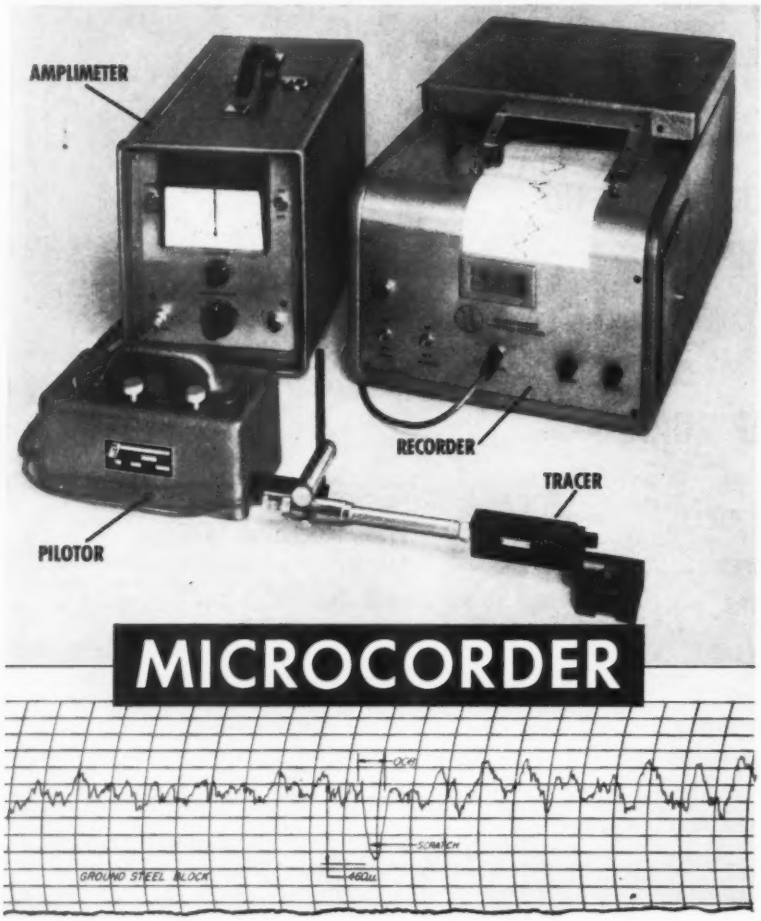
Clip to your letterhead

Send me Drill Unit details

Your Name_____

CIRCLE INFORM-A-GRAM KEY NO. 17

Presenting A NEW INSTRUMENT FOR SURFACE INSPECTION AND CONTROL



THE MICROCORDER draws a magnified roughness profile of ID, OD and flat surfaces, for any length of trace up to 2¼". From its 4"-wide chart you can readily measure the *peak-to-peak spacing* and *peak-to-valley height* of roughness irregularities — and the *width* and *depth* of pits, scratches, chatter marks and surface porosity. A wide range of magnifications is provided.

This instrument is as simple to use as a TV set, and is equally at home in shop, lab and inspection department. It is used on metals, paper, plastics, ceramics and many other materials; and it is made and guaranteed by the *pioneers* in surface-measurement instrumentation.

Detailed specifications are given in Bulletin LT138. May we send you a copy? Write —

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Manufacturer of the PROFILOMETER®, PROFICORDER®, MICROCORDER, WAVOMETER®, ANDEROMETER®, VAROMETER, CHART VIEWER • Exclusive American Sales Agent for CENSOR Dimensional Gaging and Sorting Equipment

CIRCLE INFORM-A-GRAM KEY NO. 18

... Report from page 16

ing, for instance, should be familiarized with the requirements of the process, its potentials and limitations — since the design configuration and drawing format may be affected by NC.

Tooling, he said, will probably take on many new and complex responsibilities, such as part programming, computing, and electronic data processing.

Industrial Engineering will need a new method to blend with the old regarding new concept of tools and shop loading. Shop loading may, in fact, be handled by the computer as companies learn to make full use of the equipment that's available to them.

Inspection and Quality Control will have new responsibilities, too, with NC. They'll be watching closer tolerances and be working off faster schedules. Another speaker added that Q-C will have to learn that much of the inspecting they've been used to, because of the human element in the production line, is not needed. Sometimes too, inspection will be most economically handled by the program on the tape.

Budgets and Finance will need new concepts of direct and indirect labor ratios and fabrication estimates.

Plant Engineering and Maintenance will have new problems in training personnel to cope with the alien complex controls, and closer machine tool tolerances.

Industrial Relations will need new classifications coming from new skills.

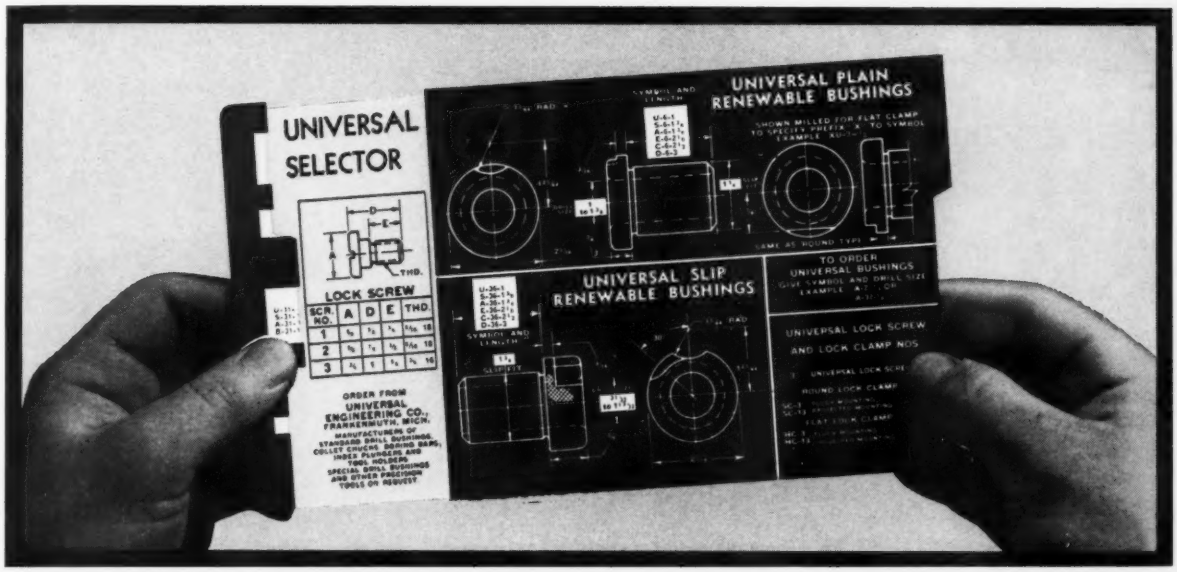
Other points to consider, as reported at the conference: Fixture design can be a problem with numerical control, because though they'll be rather simple, fixtures will have to be better because material clamping is important to accurate work with NC.

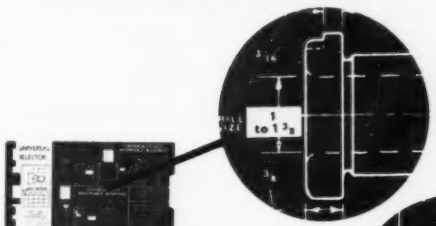
Companies will have to develop a scientific approach to maintenance planning, said Boeing's Vance Rogers. In fact, he added, they'll probably have to develop their own maintenance force.

Another conference speaker warned against taking cost comparisons first made with NC too seriously, one reason being that the programmers, for example, were too highly skilled in engineering to be using their time for programming. Their talent was used so they could assist in ironing out some of the early trouble-spots. Such skilled backgrounds aren't needed; instead, train non-engineers. **—C.E.R.**

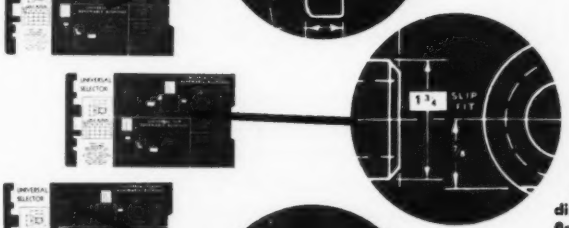
HOW THE UNIVERSAL DRILL BUSHING SLIDE CHART SIMPLIFIES JIG DESIGN

new plastic, pocket-size calculator gives all engineering data for the selection of all types and sizes of drill jig bushings up to 1¾" drill size

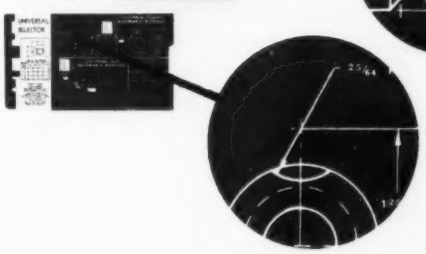

UNIVERSAL SELECTOR
LOCK SCREW
SCR. NO. A D E THD
ORDER FROM UNIVERSAL ENGINEERING CO., FRANKENMUTH, MICH.
UNIVERSAL PLAIN RENEWABLE BUSHINGS
UNIVERSAL SLIP RENEWABLE BUSHINGS
TO ORDER UNIVERSAL BUSHINGS
UNIVERSAL LOCK SCREW AND LOCK CLAMP NOS



The SELECTOR is divided into four areas, one for each of the four types of bushings. The example shown here is for the plain renewable. Using this area, you move the slide until the correct drill size appears in the drill-size window.

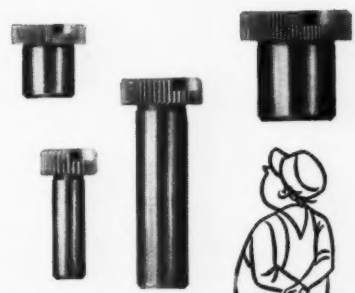


Once the drill size is set up on the SELECTOR, all other factors now appear in the windows. This section, for example (shown actual size) shows correct bushing O.D. and dimension from center to flat for clamp.



This section shows the radius for lock screw. Every factor you need for drill bushing jig design as well as for ordering the correct bushing to fit that design is shown correctly, exactly, and at a glance on the SELECTOR.

A new service to regular users of drill jig bushings is this extremely practical plastic Selector slide-chart. When designing jigs, you will save many hours, and be certain of your accuracy, with the SELECTOR. It represents the result of six years experimentation and research by Universal Engineering Co. If you are an engineer specifying bushings and do not have one of these slide calculators—you can have one for your own design work by simply requesting it on your company letterhead. Don't wait—do it today!



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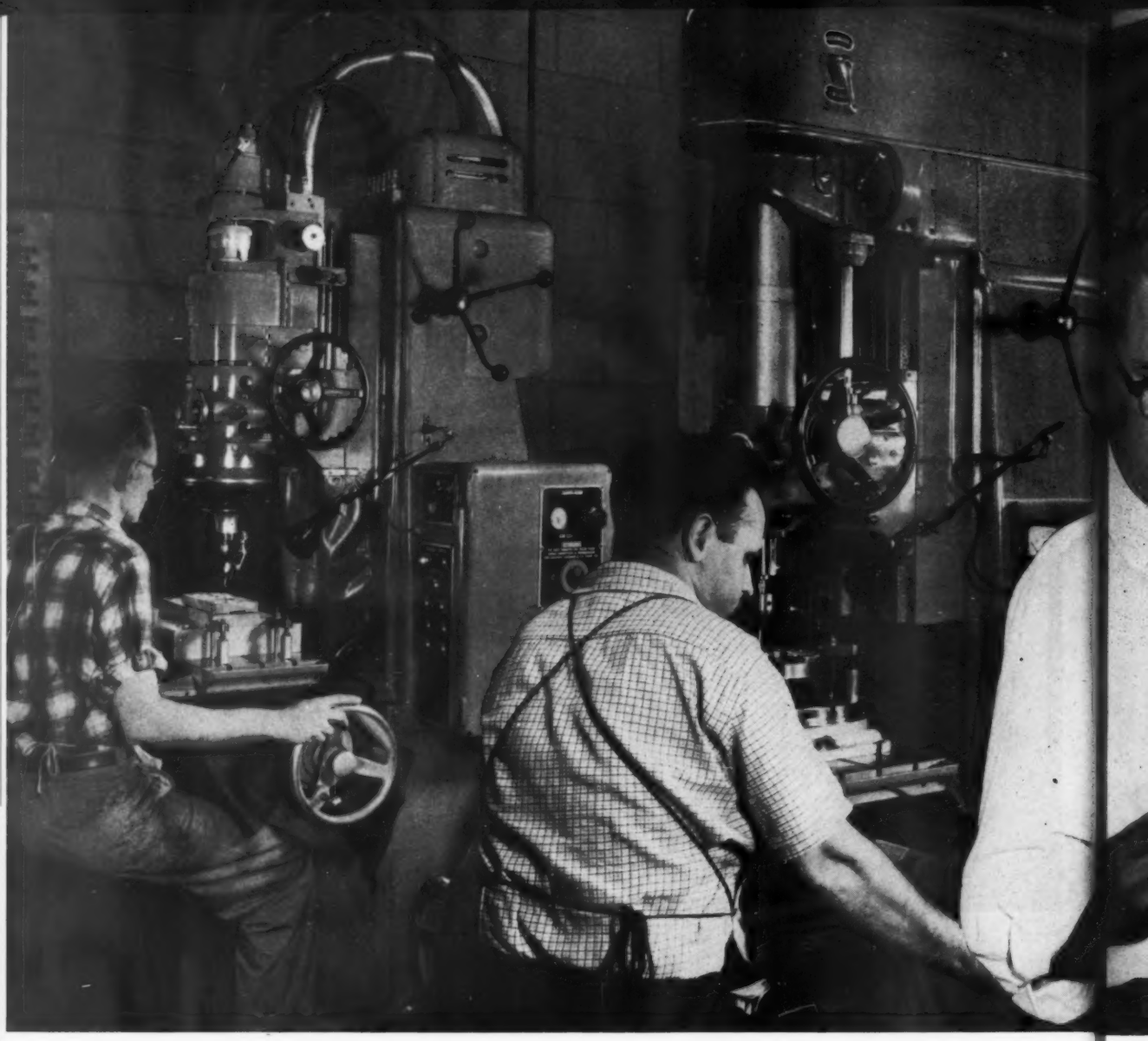
UNIVERSAL ENGINEERING CO. FRANKENMUTH 8, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 19



"We're now splitting tenths, thanks to Moore's

say Karl Harig, chairman, and Herbert Harig, president of **Harig Manufacturing Corporation,** *Chicago*

"Our operators feel these are the best machines they have ever worked on...

"Moore's No. 3 Jig Borer and No. 3 Jig Grinder take care of the tenth-splitting tolerances required by industry today..."

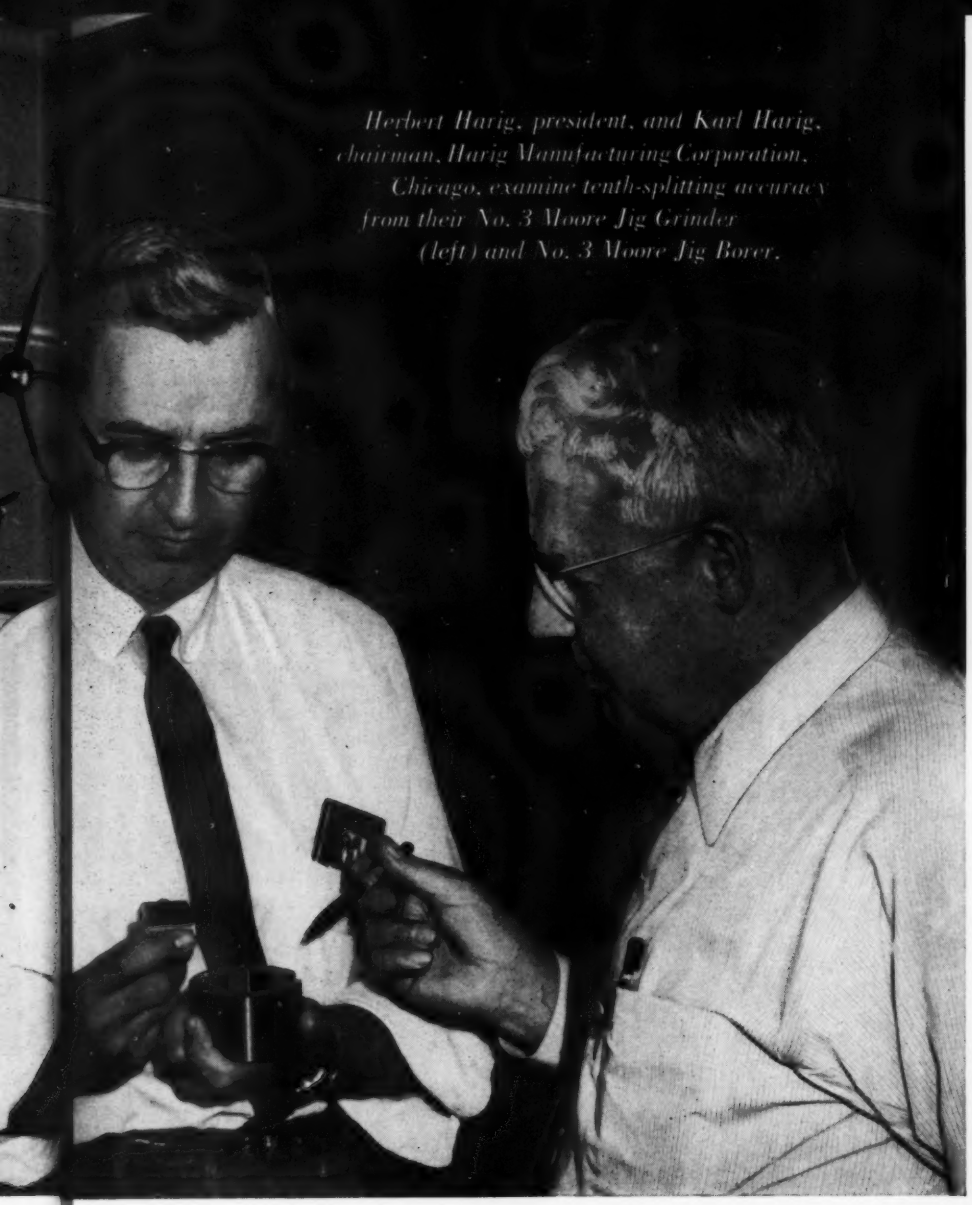
These are the words of two of America's acknowledged tooling leaders, active heads of one of the country's foremost independent producers of accurate dies—carbide, lamination, progressive, and other precision tooling.

Says President Herb Harig, former president of National Tool & Die Manufacturers Association:

"Moore's line of Jig Borers and Jig Grinders has been an integral part of the development and success of our company from 15 employees in 1937 to 120 today. We have always been

MOORE TOOLS

manufactured by



Herbert Harig, president, and Karl Harig, chairman, Harig Manufacturing Corporation, Chicago, examine tenth-splitting accuracy from their No. 3 Moore Jig Grinder (left) and No. 3 Moore Jig Borer.

's new No. 3 Jig Borer and Jig Grinder"

Made and calibrated to the new international inch.

among the first to install each new model. That's why we are among the first with Moore's tenth-splitting No. 3 Jig Borer and No. 3 Jig Grinder.

"As evidence of how indispensable we consider this equipment, over the years we have enlarged our Moore Jig Boring and Jig Grinding Department to 15 machines!"

Sums up Chairman Karl Harig:

"When owner-management invests its money in machinery, it does so only after thorough analysis and careful selection. I don't know of any machine tool manufacturer which meets both tests better than does Moore."

There's little more we can add, except to say that we stand ready to help you duplicate Harig's record of satisfaction. You can start by asking today for our detailed literature on the new No. 3 machines with their larger tables; hardened, ground and lapped ways; no gibs, no overhang.

Also, our dealer organizations will gladly share with you their extensive knowledge of holes, contours and surfaces (see column at right).

Moore dealers know holes, contours & surfaces

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- The Cameron & Barkley Co.
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MOORE ACCURACY FOR THE MISSILE AGE

CIRCLE INFORM-A-GRAM KEY NO. 31

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for fast, dependable service on

- **hand hack saws**
- **power hack saws**
- **band saws**
- **hole saws**
- **hammers**
- **ground flat stock**

LOOK FOR THIS SIGN

INDUSTRIAL DISTRIBUTORS — SERVING INDUSTRY ECONOMICALLY — THE RIGHT HAND OF PRODUCTION

for fast, dependable service on all your industrial needs.

Patronize the Distributor who displays both.

CAPEWELL

THE CAPEWELL MFG. CO.
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CIRCLE INFORM-A-GRAM KEY NO. 22

MANUFACTURING MEMOS

Best Price Wins . . . Get the most for your money by using the novel idea that's been started at Hancock Mfg. Co. They buy many small parts like washers, bushings, and small gears. To save purchasing agents' and salesmen's time, Hancock hung a display board in the plant lobby to show a sample of each part they need. Salesmen are asked to note, on cards that are part of the display, parts that they can supply to Hancock most economically. Cards go to engineering, which mails out part prints for quotes, if necessary. Simple and easy? Try it.

Gold Unwanted? . . . Gold is a contaminant for high alloy steels if, for instance, mixed in a batch of scrap bought for remelting, says F. N. Joyce, manager of scrap and salvage purchases for Allegheny Ludlum Steel Corp. If cleanliness, classification, and careful handling of alloy scrap is neglected, impurities and traces of unwanted metals can cause problems for alloy steelmakers — and lose scrap money for the manufacturer working with the gold. They'd rather have their steel "straight."

Get in the Groove . . . Off to Paris for a conference of the International Standards Organization is Walter M. Hanneman, executive engineer of the Shakeproof Division, Illinois Tool Works. He was appointed by the American Standards Association to work on international standards for screw threads applied to screws and nuts.

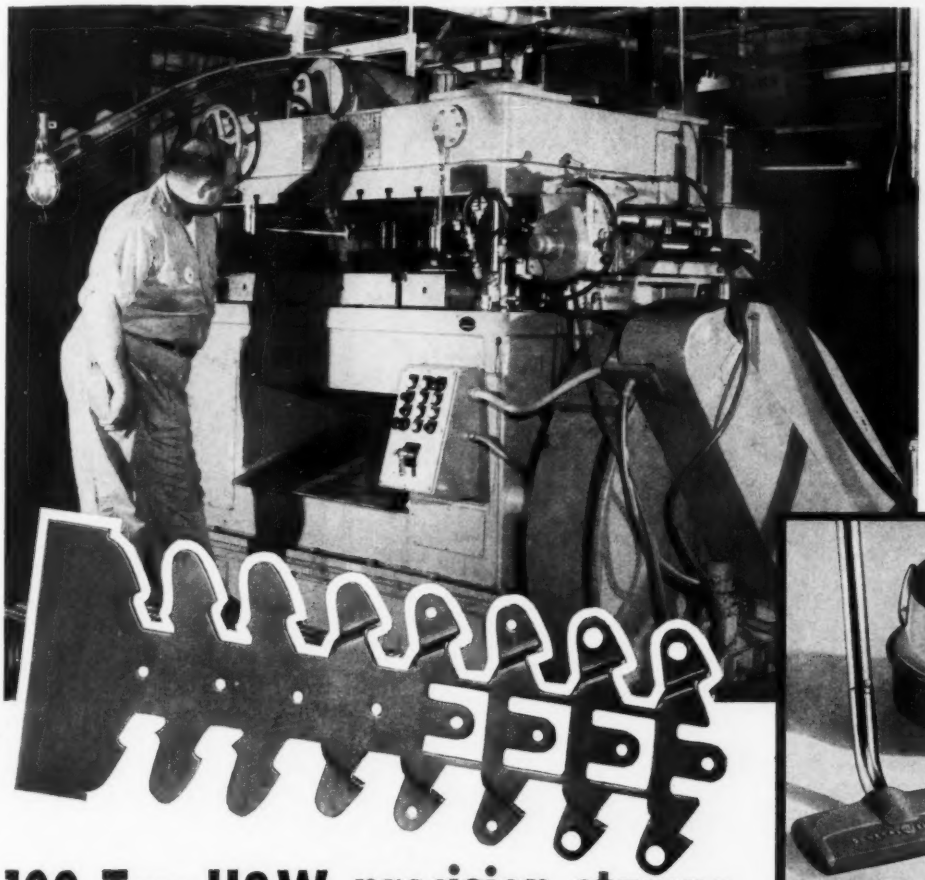
Speaking of standards, you'll find over 1800 of them listed in the 1959 Price List and Index of American Standards, available free from the American Standards Association, Department PR 66, 70 E. 45th St., New York 17.

More Plastics in '59 . . . During 1959, the plastics sheet forming industry anticipates a 10% increase in business, says Robert P. Kittredge, chairman of the Sheet Forming Division, The Society of the Plastics Industry, Inc. That would mean 155 million pounds of plastic raw materials used in sheet formed products in comparison to last year's tally of 140 million.

Corrosion Tests . . . Results of a corrosion test evaluation program for metallized coatings, started three years ago, are now available from the American Welding Society. Over 4300 specimens were exposed at eight test sites.

Speedy Cutting . . . Practical and economical ways of preparing billets of titanium and other high temperature alloys were studied by the Manufacturing Methods Division of Air Materiel Command's Aeronautical Systems Center. Multiple cutting was the fastest cut-off method, and electrolytic machining the best prospect for minimum kerf loss. No one method is way out in front, however — each method has advantages under different circumstances.

Another H-P-M Henry & Wright . . . in service at General Electric



Another 100-ton Henry & Wright double crank dieing machine stamps floor tool brackets for model C-6 General Electric vacuum cleaner at Housewares and Radio Receiver Division, Cleveland, Ohio.

100-Ton H&W precision-stamps GENERAL ELECTRIC Vacuum Cleaner Part on 7 stage die

The precision, speed and flexibility with which the double crank H & W handles both the simple and complex progressive stamping jobs make it an integral part of the automation processes in many large companies such as General Electric. Its versatility greatly extends the range of work that can be handled.

The advantages of the double crank system include high speed operation with perfect alignment, even with severe off-center loads, and longer die life made possible by a pulling rather than a pushing stroke on the die. You can form larger parts on the lower capacity machines, or produce stampings requiring high pressures with precision. The machine has a low center of gravity, giving it greater rigidity and strength. Sizes from 25 to 500-tons meet your every need.

Assure yourself of top quality work and proven production economies with H & W dieing machines. Call or write your H-P-M representative today for complete information. You'll be glad you did!

H837

H&W

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THE HYDRAULIC PRESS MFG. COMPANY

A DIVISION OF KOEHRING COMPANY • MOUNT GILEAD, OHIO, U. S. A.

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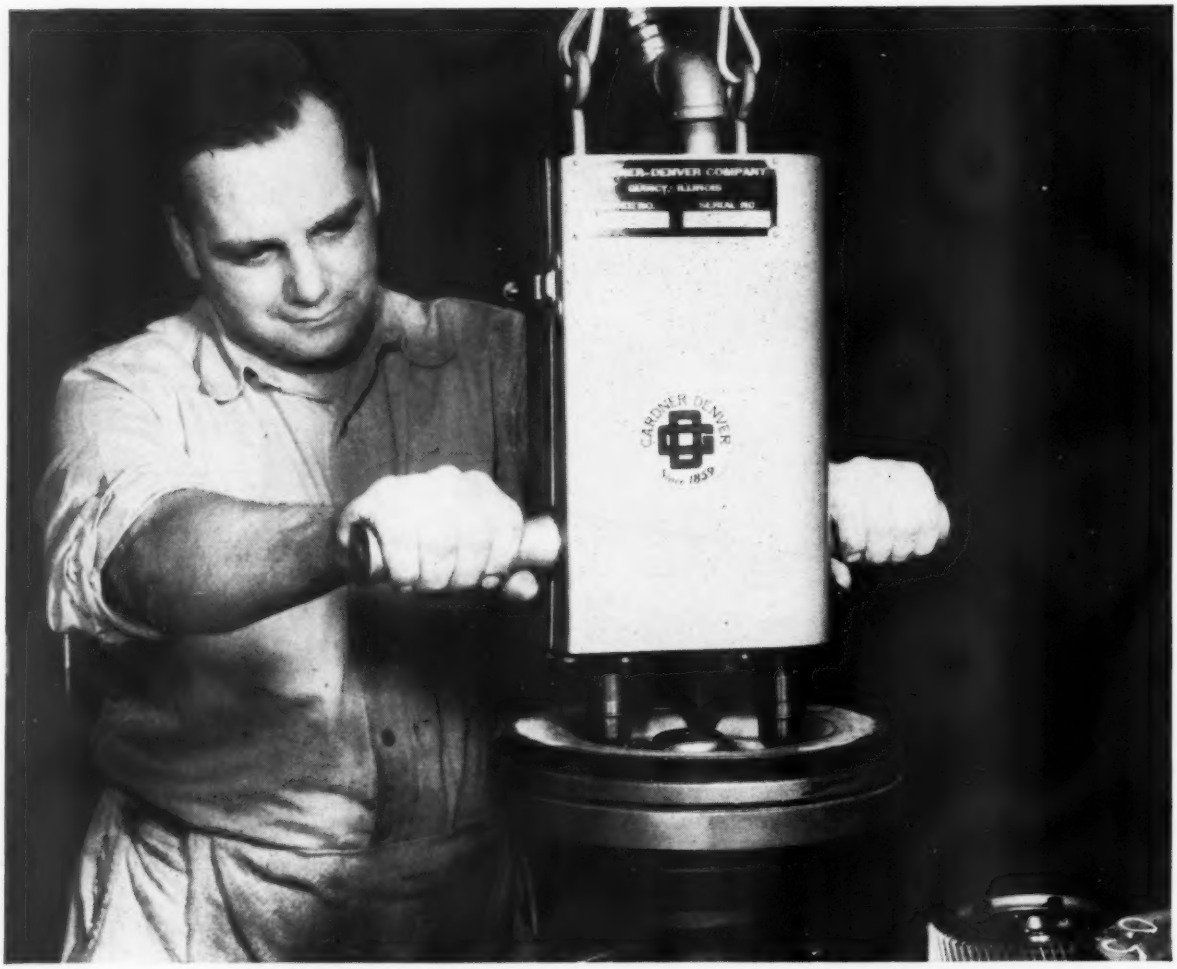


In two passes this Gardner-Denver 3-spindle multiple nut setter tightens six bolts on diesel engine flywheel.

Check this special multiple design for fast, accurate nut running

A CONSCIENCE FOR QUALITY

Gardner-Denver equipment at work throughout the world has the conscience of Gardner-Denver men behind it: designers, engineers, metallurgists, instructors, servicemen. To these men there's no substitute for quality, as at Gardner-Denver there's no substitute for men—our 100-year philosophy of growth.

Speed production, control torque with air-powered multiple nut setters—designed to do the job by Gardner-Denver. Motor units, throttle handle, dead handle, manifold—all components are specifically designed for fast, accurate multiple nut running. And all components are standardized units that can be assembled to any combination to run any number of nuts, with each nut tightened to specified torque—*all in a single operation.* Switching from job to job is quick and easy. When the bolt pattern changes, simply move the standard spindles and handles to a new job-tailored mounting plate.

Whatever your production setup—from high-volume assembly lines to low production runs—Gardner-Denver multiple nut setters speed the job . . . cut time and costs. Contact your Gardner-Denver representative for complete information.

GARDNER-DENVER Since 1859 — 100 1959 YEARS

EQUIPMENT TODAY FOR THE CHALLENGE OF TOMORROW

GARDNER - DENVER

Gardner-Denver Company, Quincy, Illinois

In Canada: Gardner-Denver Company (Canada), Ltd., 14 Curity Avenue, Toronto 16, Ontario

CIRCLE INFORM-A-GRAM KEY NO. 24

MANUFACTURING MEMOS

Acquisitions

The acquisition of Maplewood Machinery Co., Chicago, has been announced by Rockford Machine Tool Co. It'll be operated as the Maplewood Division and produce power and hand tools for sheet metal work.

The Vermont Tap & Die Co., a subsidiary of American Saw and Tool Co., has purchased Pacific Tap Co. of Burbank, Calif. It'll operate as a division of Vermont.

Heavy metalworking equipment manufacturer, Beatty Machine & Mfg. Co., has bought the Quickwork line of machine tools from the Whiting Corp.

New Company

The Warner & Swasey Co. and Asquith Machine Tool Corp., Ltd., Halifax, England, are jointly forming a new company known as Warner Swasey Asquith Ltd. to produce W & S machines for sale abroad.

Name Change

Because Sundstrand Machine Tool Co.'s non-machine tool operations have expanded, the company is now known as Sundstrand Corp.

Representatives

The Clint Helton Co. has been appointed to represent Steel City Testing Machines, Inc., in Colorado, Utah, New Mexico, Wyoming, and southern Idaho. Osco Steel Co. has been appointed general line industrial distributor for Kaiser Aluminum products in Detroit.

The Cleveland area is being served by The W. G. Jenks Machinery Co., announces the Cincinnati Gilbert Machine Tool Co.

Taking over northern Texas for The Producto Machine Co. is Machinists Tools & Supplies, Inc., Dallas.

Services

To further extend their capacity for rough and finish turning of large forgings of any alloy, Composite Forgings, Inc., has installed two of the largest lathes ever used in the Detroit area.

LASTING

precision in millionths

Fonda's hardened steel blocks, with their unusually high carbon content, give continuing accuracy long after *other* gage blocks have worn out!

. . . and for the ultimate in durability, Fonda's TUNGSTEN carbide blocks will far outlast *any* other gage block.

Blocks are available in an unusual range . . . both square and rectangular, and in sizes down to the *new* ultra thin .010 series . . . write:

FG

FONDA

GAGE COMPANY

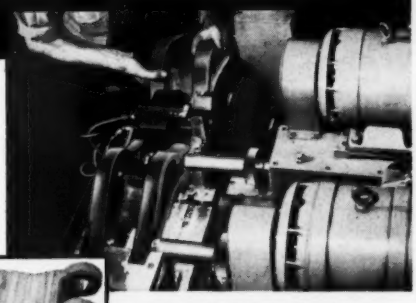
Factory and General Offices

Stamford, Connecticut

CIRCLE INFORM-A-GRAM KEY NO. 251

NEW CORE DRILL INCREASES PRODUCTION EIGHT TIMES

Wetmore Gun Type Core Drills equipped with Throw Away Carbide Tips reduce machining time from 25 to 3 minutes producing 1¾" dia. holes in one pass in heat treated, cast manganese-molybdenum steel parts. The operation is performed at Web Wilson Oil Tools, Inc., Gardena, California.



2 Core Drills are used in a special 2-spindle horizontal machine designed and built by Web Wilson. Parts are loaded and unloaded on a 2 position rapid traverse table while another part is in the work position being machined. Operation was formerly done on a drill press requiring separate drill and reaming operations.

Workpiece—Oil Drill Pipe Tong Jaw, cast alloy steel, heat treated for maximum strength.

OTHER ADVANTAGES OF WETMORE CORE DRILLS

Throw Away Carbide Tips—Square tips provide 8 fresh cutting edges that can rapidly be reset at the machine by the operator.

No regrinding required—Precision ground tips are readily replaceable and fit into precision ground seats—no adjustments required, fast tip resetting and renewal.

Less Tool Cost—Cost of tips is less than normal consumption of high speed drills and reamers. On this job 112 holes machined per tip compared to 10 holes per sharpening of high speed steel drills.

Eliminates Reaming—These Core Drills open up a rough hole in one pass removing ⅛" material on a side and produce a superior finish within .0005".

Use Wetmore's Fast, Complete Service for a full line of Standard stocked cutting tools as well as Special Cutting Tools designed from your drawing or part.

Special Tools usually designed and built within 2 weeks. Free literature on request.

Wetmore Tools

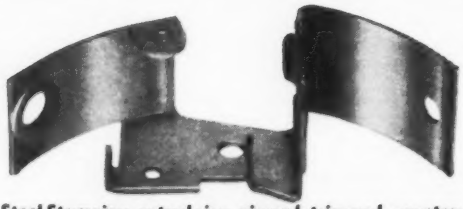
Wetmore Tool and Engineering Co.

5320 East Washington Blvd.
Los Angeles, California

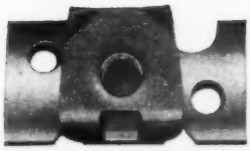
Boring Tools | Reamers | Core Drills | End Mills Routers | Port Contour Cutters | Form Cutters | Milling Cutters | Special Cutters

CIRCLE INFORM-A-GRAM KEY NO. 252

produce your STAMPED COMPONENTS WITHOUT SECONDARY OPERATIONS

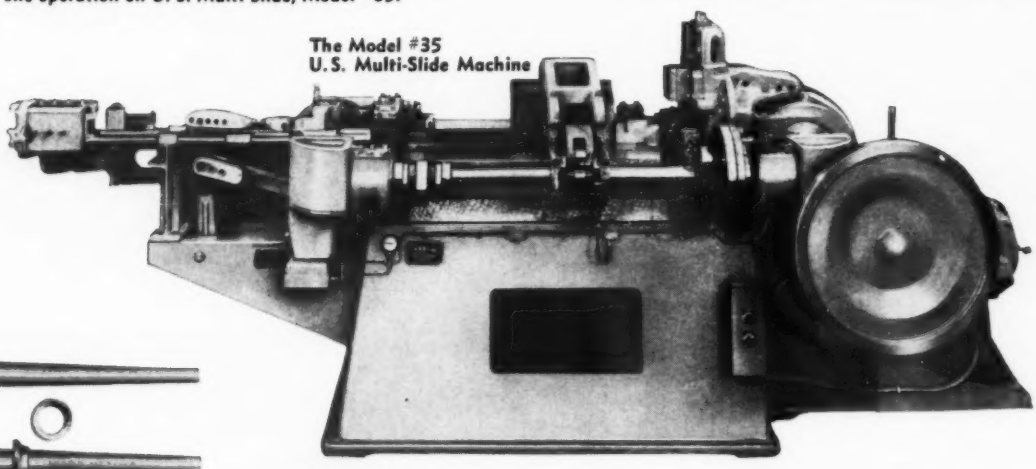


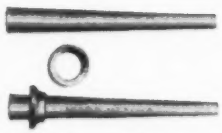
Steel Stamping, actual size, pierced, trimmed, countersunk, beaded and formed on various planes. Produced in one operation on U. S. Multi-Slide, Model #35.



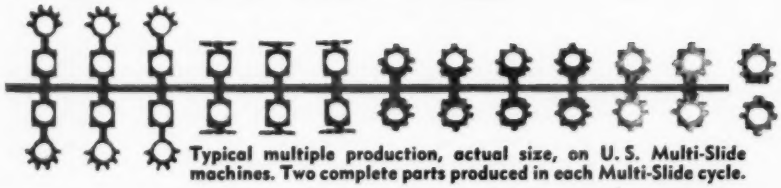
Brass Stamping, twice actual size, pierced, trimmed, formed, counter-sunk and tapped in one operation on U. S. Multi-Slide, Model #33.

The Model #35
U. S. Multi-Slide Machine





Aluminum conical tube, actual size, and shaped collar assembly. Both pieces produced and assembled simultaneously in a single cycle of U. S. Multi-Slide, Model #28.



Typical multiple production, actual size, on U. S. Multi-Slide machines. Two complete parts produced in each Multi-Slide cycle.

In a single U. S. Multi-Slide® cycle you can pierce — trim — countersink — bead — emboss — swage — tap — form — and assemble in almost any combination ● U. S. Multi-Slide "built-in motions" offer a practically unlimited variety of tooling possibilities. **In One Operation** you can produce components and assemblies that would ordinarily require multiple handling ● Stampings or assemblies produced on the U. S. Multi-Slide are consistently uniform and to required tolerances ● If you produce or purchase stamped components, investigate the cost saving potential of U. S. Multi-Slide machines. ● Ask for a copy of Bulletin 15-P or to compare manufacturing costs—send in samples or drawings of the part you want to produce.

U. S. TOOL COMPANY, INC. AMPERE (East Orange) NEW JERSEY

U. S. Multi-Slides® • U. S. Multi-Millers® • U. S. Automatic Press Room Equipment • U. S. Die Sets and Accessories

US MULTI-SLIDE

CIRCLE INFORM-A-GRAM KEY NO. 26

BUSINESS IS UP

Get your share and keep it there!

Threadwell

MAKES THE BEST PRODUCT BETTER

INDUSTRIAL DISTRIBUTORS SERVING INDUSTRY ECONOMICALLY THE RIGHT HAND OF PRODUCTION

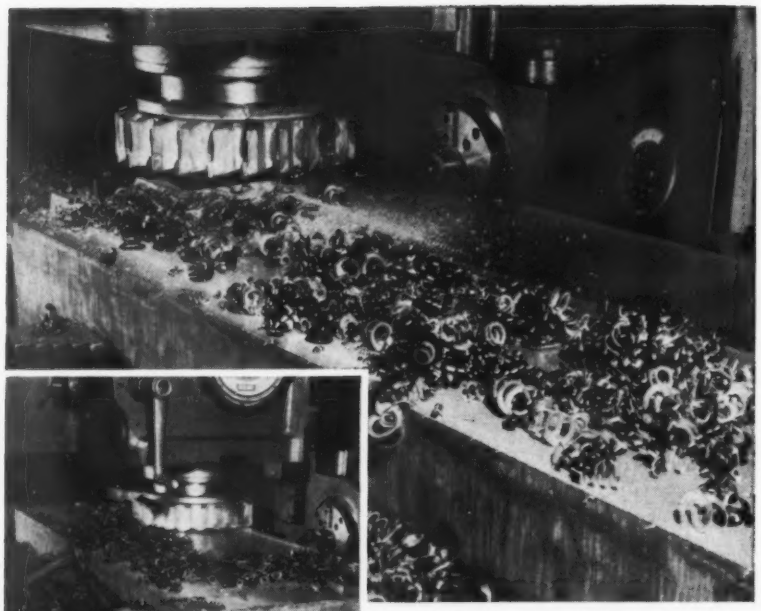
Threadwell's fine line of cutting tools and gages is one guarantee of uninterrupted production, the surest way to stay in a competitive position.

To get out front and stay there make sure you include your Threadwell Distributor in your production planning.

THREADWELL TAP & DIE CO.
GREENFIELD, MASSACHUSETTS

Stocking Warehouses: New York — Cleveland
Detroit — Los Angeles — Greenfield, Mass.

CIRCLE INFORM-A-GRAM KEY NO. 27



1/16" finish cut. Note fine surface finish, a result of true running, flywheel cutting action.

Cutter at completion of roughing cut. 1/2" stock removal. Note efficient, uniform chip formation.

1/2" STOCK REMOVAL on part of MISSILE LAUNCHING PAD AT ONE PASS!

. . . Another Outstanding NELCO Carbide Tipped Tooling Application

And that's not all . . . the 1/2" roughing cut at 14" per minute feed and the 1/16" finishing cut at 20" per minute feed were made with the *same "standard" off-the-shelf cutter.* The operations are performed on a 50 H.P. Gray Planer Mill, the tool is a NELCO 12" face mill for steel.

This versatile cutter has extremely heavy brazed carbide tips to withstand shock and interrupted cuts. Exceptional cutter weight gives flywheel effect and insures superior heavy stock removal and extremely fine surface finishes.

Send for Cutting Tool "Condensalog" with prices on 3300 "Standard" profit improving cutters to: *Cutting Tool Division, Brown & Sharpe Mfg. Co., Providence 1, Rhode Island.*

Brown & Sharpe

CUTTING TOOL DIVISION

HIGH SPEED STEEL CUTTERS

NELCO CARBIDE TOOLS

END MILLS

B·S

FOR THAT EXTRA EDGE IN PRODUCTION

INDUSTRIAL DISTRIBUTORS THE RIGHT HAND OF PRODUCTION

CIRCLE INFORM-A-GRAM KEY NO. 28

MANUFACTURING MEMOS

Services

Custom assemblies and weldments from hot or cold rolled or stainless steel are redesigned from castings or forgings or completely engineered to suit customer's requirements by The Bettcher Mfg. Corp., Cleveland. They have presses with 50' x 124' bed areas for producing large, heavy component stampings.

T & P Film Festival

"Industrial Material Handling Films" is a new 16-page booklet which reviews films available from member-companies of The Material Handling Institute, Inc., 1 Gateway Center, Pittsburgh 22. Briefly described are 63 industrial material handling films that present such equipment as monorail and crane systems, fork lift trucks, conveyor systems, and pallets and racks.

Illustrations of how large and small organizations can boost efficiency and cut drafting costs by putting photo-reproduction to work, is shown in a 23-min color movie. To get on the schedule write Graphic Reproduction Div'n, Eastman Kodak Co., Rochester 4, N. Y.

Shop applications of epoxy tooling resins are shown in a 36-min color film produced by United States Gypsum Co., Dept. 139, 300 W. Adams St., Chicago 6. It illustrates speed, accuracy, and economy obtainable with Epoxical tooling resins and gives a step-by-step demonstration of laminating and casting of items like foundry patterns, metal forming dies, etc.

Operations of the Vanadium Corp. of America, from the mining of ore to the shipment of finished products, are presented in a 23-min film. It also shows how Vancoram products are used by the iron and steel industry. Get "The Green Drum" from Vanadium, 420 Lexington Ave., New York 17.

BUY U. S. SAVINGS BONDS TODAY

AIRBORNE *TACAN* DEMANDS THAT PARTS LIKE THIS FIT PERFECTLY, EVERY TIME

. . . and here's how ITT's Standards Lab makes sure they do

This heater and cathode contact ring assembly is used with a lighthouse-type electron tube in the airborne unit of TACAN, a military and commercial aerial navigation system.

As in all TACAN components, this mating part must be readily *interchangeable* in case of component failure. So Federal Telephone and Radio Company, a Division of International Telephone and Telegraph Corporation, turned to their Standards Laboratory *before* starting production.

The heater and cathode contact ring was *optically* inspected—on a Kodak Model 30 Contour Projector. After analyzing the results, minor changes in tooling were suggested. Result: a perfectly matched part, completely concentric and interchangeable.

Whatever you're inspecting . . . Whether it's tools, gages, dies, electrical or mechanical components, the Kodak Model 30 Contour Projector provides you with a projected image that's as *free* from distortion as the science of optics will permit . . . *accuracy* across the entire face of the big, 30-inch screen. Images are sharp, high-contrast; erect and unreversed at all magnifications. Changes in magnification can be made at the flick of a switch.

More refinements . . . You also get efficient head-on surface illumination and a full 16″ throat clearance between collimator lens and front mirror. This clearance is constant at all magnifications, permits staging of large parts without repositioning.

The many other advanced refinements, extreme optical stability, and rugged construction of the Model 30 Kodak Contour Projector make it a leading choice for large-screen precision micrometry or routine gaging.

Cut inspection costs . . . Along with accuracy, optical gaging with Kodak Contour Projectors offers you savings in gage costs, increased inspection rates, and the economies that result from a minimum of operator training. You can use optical gaging almost anywhere in your plant . . . receiving, assembly, production, inspection, toolroom. There are 6 Kodak Contour Projectors to choose from, one matched to your inspection needs. Get all the facts by writing for our detailed catalog.

At the ITT Standards Laboratory, the Kodak Model 30 Contour Projector provides the accuracy needed for testing and servicing master mechanical and electrical measuring devices.

Special Products Sales

EASTMAN KODAK COMPANY, Rochester 4, N. Y.

the KODAK CONTOUR PROJECTOR

Kodak
TRADE-MARK

CIRCLE INFORM-A-GRAM KEY NO. 29

YESTERDAY'S PIONEER . . . TODAY'S LEADER

WELDON / HEAVY DUTY END MILLS AND HOLDERS

(BOTH ARE STOCK ITEMS)

● Look at this rugged 2″ diameter Weldon end mill with 4″ long flutes which made a 2½″ deep cut in a solid block of die steel—4140 steel heat treated to 260 Brinnell. The feed was 1½″ per minute, and the material was removed at a rate of 7½ cubic inches per minute.

This HEAVY DUTY Weldon end mill is held by an end mill holder which bolts securely on to the nose of the milling machine spindle. The holder is driven by two drive keys on the spindle nose. The 2″ diameter shanks of these heavy-duty end mills are securely held by two large hollow head screws.

For top performance and sturdy long life in end mills—large or small—look to Weldon.

SEND FOR LATEST CATALOG NO. 11

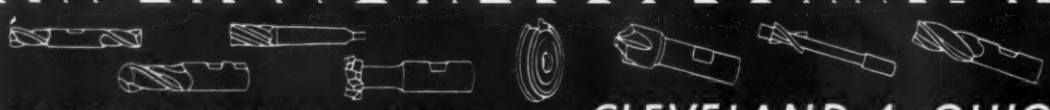
OVER 40 YEARS OF LEADERSHIP SINCE 1918

Catalog list numbers are now marked on all Weldon tools and holders as an aid when reordering . . . another WELDON FIRST.

Weldon distributors throughout U. S. A. and Canada carry complete stocks to serve you.

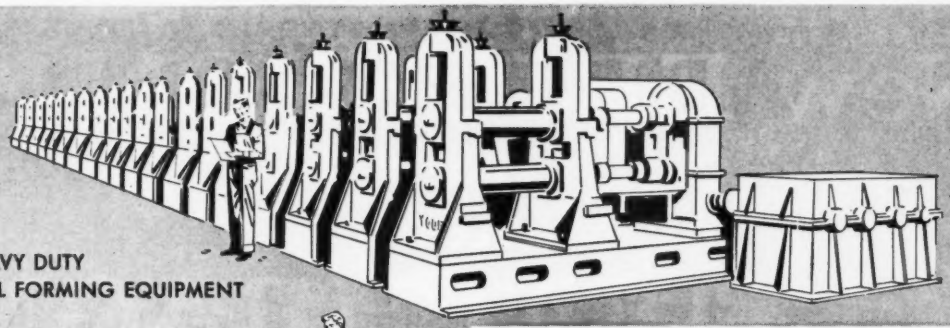
HD4

THE WELDON TOOL COMPANY

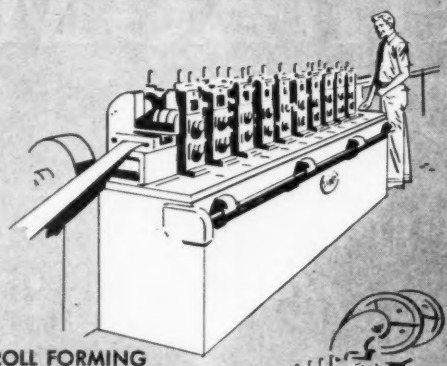


3000 WOODHILL ROAD · · · CLEVELAND 4, OHIO

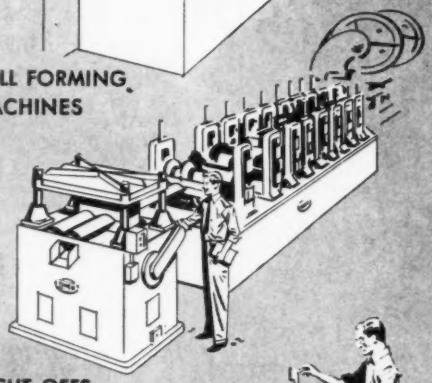
CIRCLE INFORM-A-GRAM KEY NO. 30



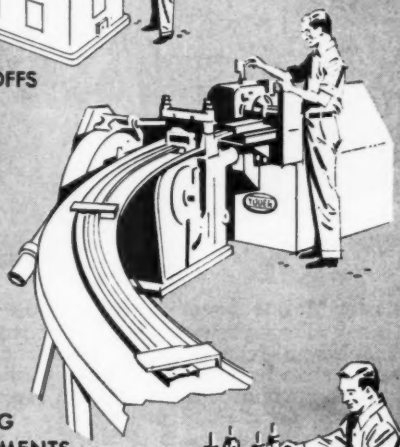
HEAVY DUTY
ROLL FORMING EQUIPMENT



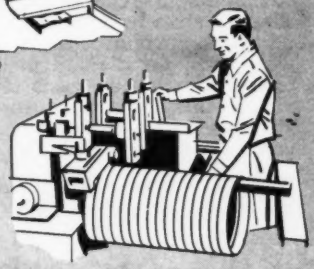
ROLL FORMING
MACHINES



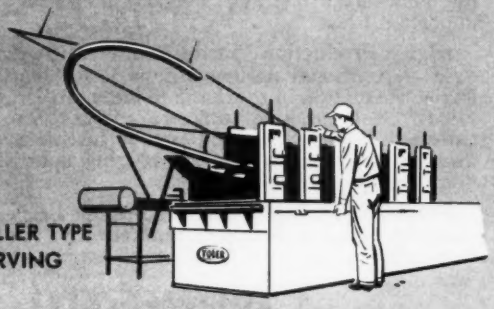
CUT-OFFS



CURVING
ATTACHMENTS



COILING
EQUIPMENT



ROLLER TYPE
CURVING

YODER COLD ROLL-FORMING EQUIPMENT

for profitable mass production

High speed, YODER Cold Roll-Forming machines are the most economical method for mass producing structural or ornamental shapes. One machine with one operator can form up to 40,000 feet of shapes per day. Even on a part-time basis, a YODER Cold Roll-Forming machine can prove to be a profitable investment.

YODER flexibility works for you too, curving, coiling, ring forming, multiple roll-forming and embossing—on a wide variety of metals—can be incorporated into your production line. Practical, YODER-engineered design minimizes maintenance and downtime... assures uniformity, accuracy and reliability of your end product.

In addition to Roll-Forming machinery, YODER also makes a full line of Rotary Slitting equipment, Pipe and Tube mills. Send for the fully descriptive Cold Roll-Forming Book.

THE YODER COMPANY
5501 Walworth Ave. • Cleveland 2, Ohio

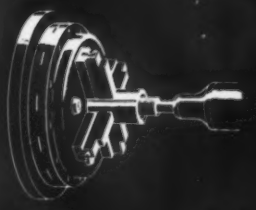
ENGINEERING
YODER
MANUFACTURING

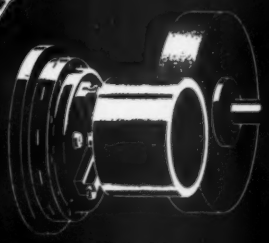
COLD ROLL FORMING MACHINES
PIPE AND TUBE MILLS (ferrous or non-ferrous)
ROTARY SLITTING LINES

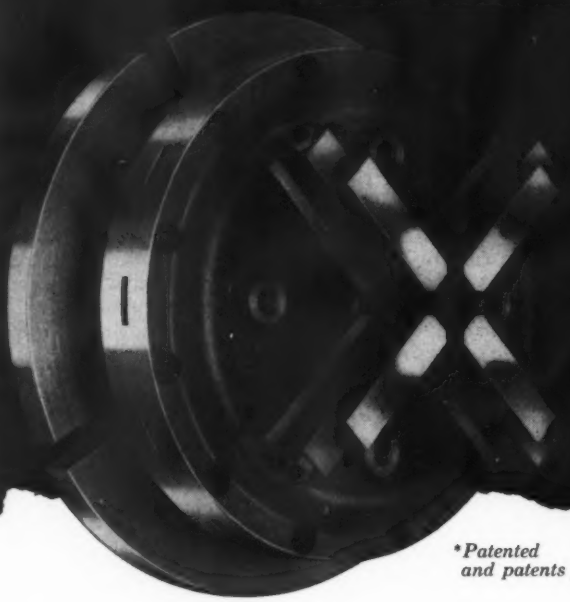
CIRCLE INFORM-A-GRAM KEY NO. 31

New ERICKSON Air Operated or Manual DIAPHRAGM CHUCKS

for utmost accuracy and concentricity







√ *greater jaw rigidity*

√ *internal or external chucking*

√ *easy diaphragm replacement*

√ *eliminates air leakage*

**Patented and patents pending.*

Basic design of new Erickson Air Operated Diaphragm Chucks* offers distinct advantages in three important areas:

Higher Production Speeds. Reduction in weight over conventional designs means lower inertial forces. Reduction in overhang reduces centrifugal forces; cleats provide sufficient counterbalance. Conventional compression-type adjustment for locating jaws gives greater jaw bearing and maximum rigidity for highest speeds.

Precision Performance. Traditional Erickson precision design and construction for utmost accuracy and concentricity.

Lower Maintenance. Diaphragm construction, with hold-down screws located on flat outer edge of diaphragm, reduces stress concentration and eliminates need for clearance holes through diaphragm for mounting bolts. Design gives higher yield point for diaphragm longevity and easier replacement. O-ring seals eliminate air leakage. Sludge slots around periphery promote escape of grinding dust and other maintenance-causing particles. AA-9606

Write for your free copy of "Erickson Air Operated Diaphragm Chuck" today.

ERICKSON TOOL COMPANY

34451-7 SOLON ROAD • SOLON, OHIO

COLLET CHUCKS • EXPANDING MANDRELS • AIR-OPERATED CHUCKS • FLOATING HOLDERS • TAP CHUCKS
AUTOMATIC INDEXING • MASTER SPACERS • DIAPHRAGM CHUCKS • PUSH-ON ARBORS • QUICK-CHANGE HOLDERS
EXPANDING COLLETS • END-CLAMPING CHUCKS • AIR CYLINDERS (allowing stock to pass through)
EXPANDING JAW MANDRELS • SPECIAL HOLDING FIXTURES

CIRCLE INFORM-A-GRAM KEY NO. 32

RADIO – BOOMLET OR BOOM?

A NEW FIELD OF RADIO communications has just opened up that presents an enticing picture to manufacturers, marketers, and users, alike.

In contemplating this we are not shedding any crocodile tears over the state of the radio industry —it's a multi-billion dollar business in its own right. The postwar years have seen a state of growth in dollar volume and units which has greatly belied those prophets of doom who, upon the advent of TV, were busily composing requiems for the 6-tube superheterodyne.

Now, for every magic lantern in the living room's TV corner, consider the number of AM radios, clock radios, portables, and FM radios throughout the rest of your domicile, from bedroom and bath, to kitchen and laundry. And don't forget that wherever you go, your car radio goes with you—a few million more! One might say that today, an antique automobile is one without a radio!

In all of this activity you have been on the receiving end only. Now, after prolonged and profound deliberations by the Federal Communications Commission you are now able to engage in two-way radio communication without having to take a technical examination in order to obtain an operating license.

The new channels that have been opened to you are designated by the F.C.C. as the Citizens Radio Service and are intended for personal or business short distance radio communication, signalling, and radio control.

The F.C.C. governing regulations spelling out just who is eligible to use this newest form of personal communications include any citizen of the United States who is 18 or more years of age, as well as partnerships, associations, trusts, or corporations meeting the citizenship requirements of the Communications Act of 1934.

This is broad enough inclusion of people and applications to constitute a marketing man's dream, and to paint a picture of what the Citizens Radio Service offers you — for business and pleasure.

Although your Citizens Radio Service stations are limited in power to an input of from 5 to 60 watts, depending on the purpose as licensed, this will allow you up to ten miles of toll-free "private line" communication between home and office, office and warehouse, island camp to boat or mainland. Thus, with two or more units you can talk with your family, friends and associates from your car, home, boat or office.

The equipment itself is neither expensive nor complicated to operate. In radio parlance it is known as a transceiver, i.e., a combined transmitter and receiver in a single cabinet less bulky than a portable TV. Listening can be done by headphones or small built-in speaker. You transmit, or talk, into a microphone. With a simple switch you flip from "talk" to "listen."

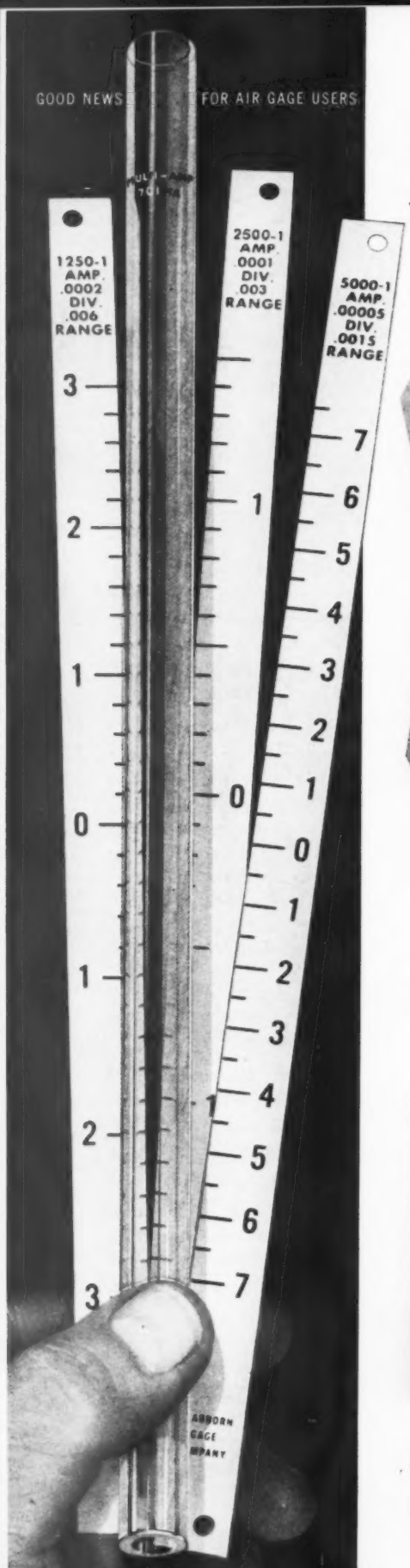
Your personal radiophone station can be powered by plugging in to the 117 volt line or, with a vibrator power supply, is operable from your 6 or 12 volt car battery.

If you are a do-it-yourselfer, you can assemble your entire station from a kit, including transceiver, and choice of antennas (for "fixed" location or mobile) and power supply for little over $50.00.

The Citizens Radio Service with its potential benefits and additions to both your working efficiency and enjoyment of your leisure hours represents another upward hitch in our American standard of living.

E. Willard Pennington

Editor



Just 1 tube serves three amplifications

... and it's available now exclusively with

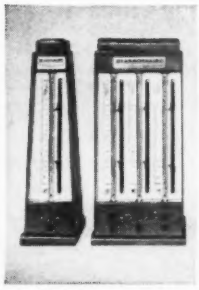
Dearbornaire

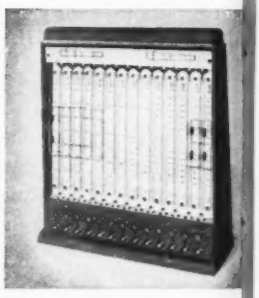
Column-Type Air Gage Instruments

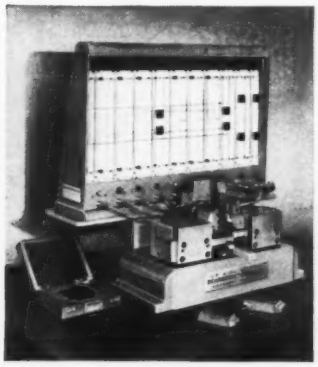
No fussin' around with single-purpose parts! Now, with Dearbornaire's new "Multi-Amp" Tube, you can convert an instrument from one amplification to another simply by changing calibrated scales. What's more, this unique new tube has a "characterized" variant rate of internal taper which . . .

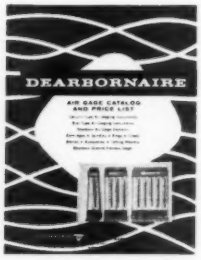
1. Creates an air circuit that is truly linear over the full extent of the calibrated scales to give you finer accuracy of measurement. 2. Permits greater clearance between tube wall and float, thus minimizing down-time for cleaning and maintenance. 3. Allows up to three times greater total element gaging clearance to reduce wear, extend life, and cut gaging costs.

Dearbornaire Instruments are offered as single or multiple column units in amplifications of 1250-1, 2500-1, 5000-1, and 10,000-1 or in any combination thereof.









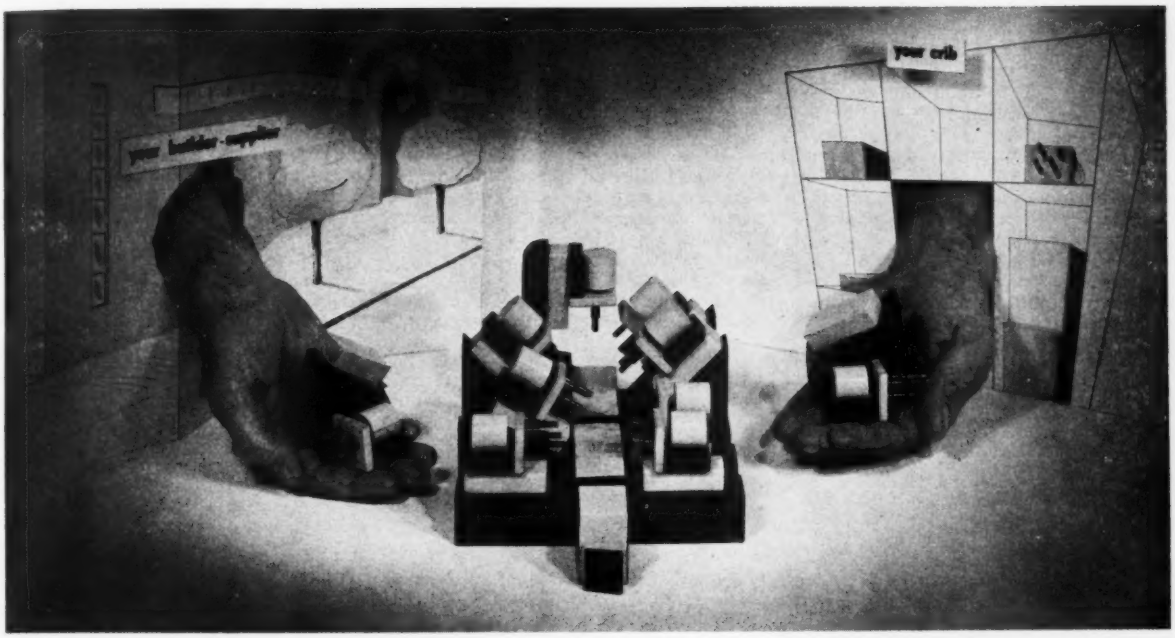
New Catalog contains complete price information on Dearborn Instruments and Air Gage Cart Spindles, Rings, Snaps and Fixt Send for your free copy today!

Air Gage Division

DEARBORN GAGE COMPANY

32330 Ford Road • Garden City (Detroit), Michigan

CIRCLE INFORM-A-GRAM KEY NO. 34



Although the "L" shaped components, the ones which carry spindles, are not standardized, we feel they complete the picture portion of this story.

INDUSTRY AGREES ON 'BUILDING BLOCK' STANDARDS

by William E. Hoffman
Associate Editor

Production Machine Standards

Our earliest records of combined builder/user effort to standardize production machine tools goes back to '53. The '53-55 interim saw many discussions. In '55 proposals and objectives were set forth and surveys made concerning user-builder problems. Both groups set up committees to study findings. A 4-day meeting in Jan. '59 started to finalize principles, and subcommittees studied dimension finalization. In March, tentative Standards were sent out for review and comment. By June, the comments were incorporated in the still-tentative Standards which were sent out again. Industry is to speak up before July 1, or the Standards are final.

Here are the Standards, as accepted tentatively by Industry, at our press time. Preceding the Standards you'll find our interpretation of their use and their significance to Industry. Any changes or additions made in the Standards will be published in subsequent issues of Tooling & Production Magazine.

PROBABLY MOST OF US HAD, DURING CHILDHOOD, TINKER TOYS, an Erector or Meccano set, Lincoln Logs, or something with which we could build—all set up to standard sizes. The Building Block concept of machine tool construction is like that, since there are limitless arrangements and combinations possible. But, this is not kid-stuff. On the contrary, Building Block or Modular constructed machine components run into many millions of dollars a year—often one company alone lays out money in these quantities, and the total expenditure of small companies combined is also huge. The boon of this is that the waste portion of these expenditures can now be eliminated. This will be true for all, and even the small user will now be able to get into the act.

Prior to these Standards, the greater part of a production line was often scrapped after use just because of its lack of standardization—or re-usability. A big help, though, had been the standardization within any one builders' shop, making that equipment usable again with equipment from the same shop.

However, due to our healthy free-enterprise system, based on contract letting after quotes, it is normal for any production line to carry the nameplates of a good number of suppliers. And, until these Standards were worked out, comparable components from different suppliers were not interchangeable. So, if a product change evolved, and this is inevitable, the production line and/or single station machine components were seldom compatible. Hardly ever did interchangeability between suppliers work out without expensive rework. So what to do? Scrap it! Millions of dollars worth of production machine components were and are being thrown away yearly. *This* rather than lose lead time and go into the expense of engineering dope-out and shop time to make extensive adaptations.

This is not to say there has been no effort to ease the situation. There has been, and we will quote instances later showing that in some machines up to 50% savings have been realized. However, to come by savings of this magnitude, product changes have to be from like product to like product, with plenty of thought in anticipation of the change. Also a factor until now, it was necessary at times to disregard the competitive bid practice. Instead of the advantage of spreading the build around it had to be placed with one supplier. This procedure offered the optimum then, since components from any one supplier were the only ones compatible. But there are some 15 major suppliers and many small builders. Without Standards to go by, it was impossible for them to think alike on sizes, arrangements, configurations, and attaching face dimensions.

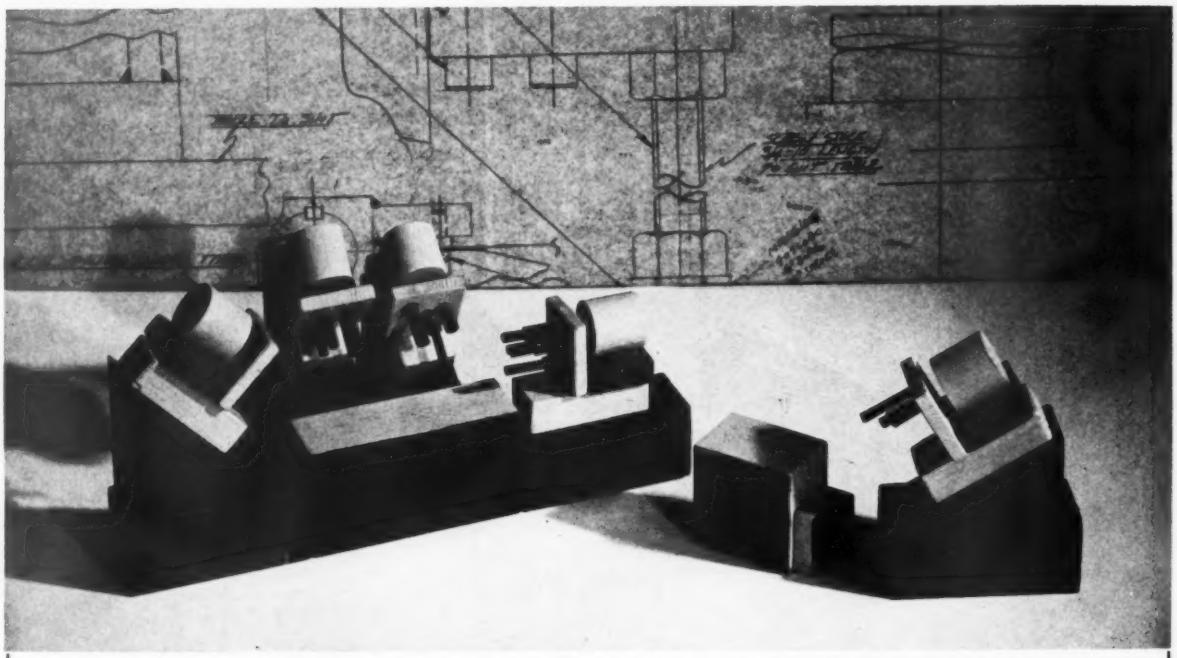


Fig. 1. Main bases, which accept holding and/or transfer mechanisms on their top surfaces, form nuclei for the other modules. Whether they are part of an in-line transfer machine, as in the title photo, or part of a way-type machine, seen here (four way), the working heights are standardized (42″), as are the mating faces for attaching the wing bases.

These mating faces have keyways "let into" them and appropriate holes for attaching-bolts. There are also tapped holes for locating blocks (keys) and positioning blocks. Keys bolt-in vertically and horizontally.

Normally, these bases will be two stations long, accommodating four wing bases, two on each side; especially when used in transfer machines. Also, one-station bases arranged for two wing bases come under the standardization. Or, there can be three or four standardized faces on a single station main base. Regardless of the number, each face will take a wing base of the same size classification.

Whether a single station main base has two or more standardized attaching faces (refer to Standards, page 41) its function is the same. However, the method of locating wing bases may vary. Main bases may have a vertical key on a station centerline in place of vertical keyways placed to the side of each station.

Lateral location of wing bases is done by blocks bolted on the side of the main base; the locating block supplanting the key methods above. Where a locating block is used, it is necessary to control the width of the main base so that when the block is mounted on the side it will be in proper relation to the bolt-on hole pattern. This is no hardship since it is not necessary to finish the whole side of the main base; only a finished pad is necessary to accept the block.

The same condition exists on the other side of the station: When the latter method is used a positioning block is to be bolted on. These positioning blocks are for snugging the wing base to the key and/or positioning the other modules mounted atop the wing base in proper relation to an oriented workpiece. Where wing bases are located by a central keyway, a positioning block is not necessary.

Where positioning blocks are used, shims between the key and the edge of the wing base offer more precise location.

In this grouping of modules the two on the right are not a part of the group on the left. The square single station base, with the angle adapter on one end, is a main base about which modules might be grouped to construct a modest machine. Any or all of its vertical sides can be supplied standardized for attaching horizontal angle adapters, and/or wing bases.

On the left, to illustrate versatility, modules have been grouped around a two-station main base with wing bases attached to its ends. This could be called a four-way machine.

In its simplest concept the two-station main base doesn't have standardized end faces, but if a user anticipates a need for a main base so equipped, standardized ends might be provided and not used until some future date.

The grouping shown at the left might make up a shuttle type machine. The workpieces could be loaded on the main base at one station, work performed, and then shuttled to the other side for additional machining.

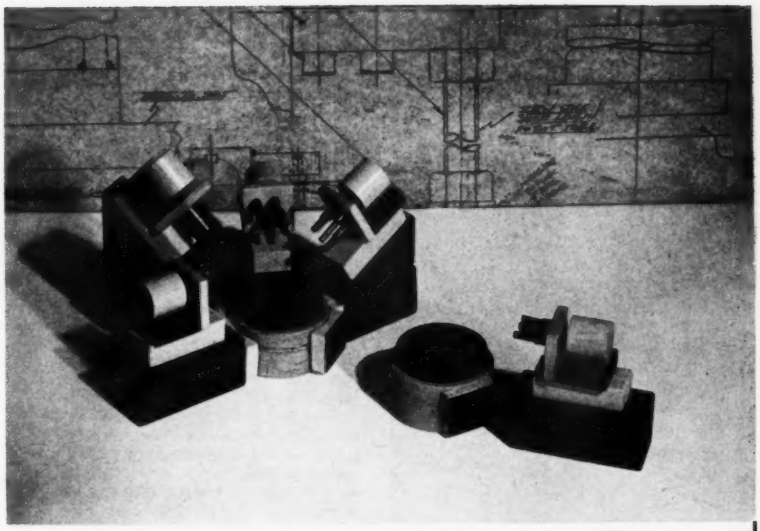


Fig. 2. Attachment of standard wing bases to a dial base can be done in two ways: By wing base adapters attached to the dial base with T-bolts in T-slots around the periphery, or by standardized faces machined into the dial base.

T-slot dimensions are established in the Standards, but their number and location is left to the manufacturer's or user's needs.

In either case, the face (adapter or integral) that accepts the wing base is standardized for its intended machine size (1, 2, 3, 4, or 5).

There are advantages to both concepts and, although your present needs may dictate one design, we urge you to consider both in terms of your present as well as future needs.

The dial base, set apart and to the right, shows only one integral mounting face. This points up the fact that the number of standardized faces for this module is not fixed in the Standards. The number of faces used is "to suit" the demands of the user and the imagination of any planning committee involved in re-use procedures. It would seem wise, however, to think well into the future as to the number of faces specified on any one design. Actually the number of stations possible about a dial base is governed by its diameter, and this is again "to suit."

In developing these standards every effort was made to permit freedom and versatility. The only fixed dimensions here pertain to the 42″ working height and the mating face (integral or T-slot).

The Standards recognize the fact that dial bases may be combined with a center column to mount machining heads. Provision for this has been left to the discretion of the customer/user or the builder/supplier. The only variable concerning a center column is its size in respect to standardizing its faces to accept standard feed units.

What These Standards Can Mean to the User

You will soon be able to purchase, if you wish, standard production machine compents from any number of suppliers and use them interchangeably. You will be able to specify and buy: *Main bases, wing bases, feed units* (way type and quill type), *horizontal angle adapters, angular columns, wing base adapters* for dial type bases, and *vertical columns*, to name a few.

Your best approach to using standardized Building Blocks might find you taking most of these components from your own storage and putting them together to your own engineering specifications. Or, you might prefer to purchase the Building Block units and the engineering from a supplier — the supplier to work-in as many units from your shelves as possible. If you are a concern that has had occasion to dismantle and "shelve" some of these components from a previous machine, so much the better.

If, on the other hand, you are just going into business, or want to delve into production in a way requiring automatic machines, these Standards should give you confidence to go ahead. Just knowing they are standard and that you can use them time and again will help in your initial decisions. Except for accident or wear (some are used static—no wear) there is no depreciation. And, both accident and wear can most often be remedied more economically than a new purchase.

It's difficult to make predictions in any way except in generalities, but one of the examples recounted to me had to do with a machine tool builder rebuilding another supplier's machine at a savings to the buyer of 40-50% of the price of a new machine. This was only possible because the 20-station machine was originally built of components made standard within themselves. It is interesting that this rebuild took place a couple of years before these Joint-Industry Standards were developed. What implications can we dream into the future where automation (coming to be commonplace) dealing with machines of hundreds of stations will be completely built to Standards?

Even though the machine mentioned above was rebuilt at tremendous savings, most of it had to be lifted from its foundation and shipped to the rebuilder. This probably won't be necessary when the known members of an existing machine are standardized. It will only be necessary to move the standard members to their new location. In some instances, the move may be only a few feet—or not at all.

One of the big features, often more important than cost, is leadtime. Planning can be done in your offices or in the offices of your suppliers, while you are turning out another product and before machine conversion. Then just rearrange the machine, and possibly add to it, for the new "moduvation" concept.

Maybe this sounds simple, and relatively speaking, it is.

In another case, approximately a half million dollars was saved by using the Building Block concept. This had to do with production engineering being tipped off that a part change was coming up. It was a pretty dangerous way to operate but they knew the saving in leadtime was worth the gamble. After some educated guessing, the new machine functions were anticipated and it was ordered. Parts were to be standard in relation to themselves. Certain stations were left open for the final change order and the machine was delivered, set up, and made ready to run. When the change was firm, these open stations were filled with the proper units and they were ready for production. Leadtime was almost zero.

Maintenance in any plant is the watchdog of continued high production. But maintenance people work best on equipment with which they are familiar. Nothing, then, could help them more than having the same machinery to maintain.

Educating these people to maintain new equipment often requires spending a good deal of unproductive time (and money). Yet it's an important factor in keeping a manufacturing facility "turning 'em out."

Fig. 3. Starting from the bottom we have: A wing base, whose left vertical face can be attached to a main base of compatible size; a feed unit, located by dowels and properly bolted; and a tool holding unit, which could be fed to the work by a power source in or "hung on" the feed unit. As we have stated elsewhere, there is no standardization of tool holding unit mounting faces.

Two types of feed units are standardized: The way-type and the quill-type having identical and standardized dimensions for their wing base mating surfaces throughout the range of sizes (see Standards).

In the case of the way-type feed unit the platen (top) for mounting the tool holding unit will be tapped "to suit" for hold-down bolts. A standard keyway is to be provided, and a dowel may be needed for fixing laterally, also "to suit." Tapped holes in platen should be on centerlines shown in the Standards and should be spaced at distances divisible by three.

The mounting surface treatment for a quill-type feed unit is dictated by the quill housing mounting specification.

It should be noted that there are three pairs of dowel holes provided in all wing bases for optional positioning of the feed units in relation to the position of a workpiece on the main base. Also, provisions have been made for feed units of either short or long stroke. The machine design should include the proper sized wing base; hence wing bases also are standardized in longs and shorts in each size.

Although there is a great similarity about all machines, they all have their own peculiarities. So, if a machine is tossed out and a new one brought in the education process starts all over again.

This education problem often concerns many; engineering and production as well as maintenance must become acquainted with the new master of the house. But the more this new machine is like the old, the less expensive the get acquainted period.

We are talking here of the standardization of the very basic production machine components — main bases, wing bases, etc. But there may be other areas of these machines that can be standardized. Probably this is not for all machines but for machines within any one user's facilities. For instance, one engine manufacturer is turning out "V" engines in two sizes on the same transfer machine. To do this, modular design of both product and machine were necessary and successful.

What These Standards Can Mean to the Machine Tool Builder

We understand one of the biggest aids to increasing the builder-supplier's business will be this Standard concept of building production machines. Although the large user group may buy fewer completely new machines, the builders will certainly be doing an exciting rebuild business.

From the writer's point of view this could be bigger than past volumes of new business. Here's the reasoning: In the first place, this rebuild *will be* new business. It will have to do with model changes and new products and consequently machine changes. It stands to reason that all product changes can be brought about much easier—through management — and more frequently if the cost is down. We understand 50% cost reductions and better will be possible.

Of course, those that cry "model changes are too frequent now" may not agree with this. But, it is the way our economy works, and if we get improvements and better products each time, we are making progress.

So this development will increase the builder-supplier group's total business and they won't even have to wait until it catches on or until the user gets stocked up on these standard units. Business will be as it was before Building Blocks and better, since selling standard units to first time users will be augmented by the increase in rebuild.

Although it may be necessary for the builder to increase his personnel and re-train certain of them for a rebuild approach, this should be no hardship. Engineers design most machinery around standard purchased components anyway, such as gear boxes, clutches, and motors. This rearranging of used machine components will be just another part of the job.

Another important cost phase of this machine rebuilding will be the speed with which a job can be done in comparison to one started from scratch. Since there will be no need to ship the components back to the builder, it will be possible to come up with lower quotes. But, the big savings will come when the builder finds he will not have his money tied up in a lot of "iron" until completion, shipment, and payment.

It is very possible that a new class of traveling engineer-millwrights will come on the manufacturing scene; men who will design a proposed "rebuild," go out and rearrange, add to, and rework the old into new.

Lead time can be arranged between the builder and user to suit necessary design and shutdown time of the machine to be rebuilt. Both should profit here, for if the builder can know far enough in advance he can take advantage of a slack period or design time lull to do the engineering work. Then, when the machine is shut down they can be ready to put it in running condition quickly for the new job. Even if there is a production area change from one plant to another it would appear that much lead time could be saved by assembling the new machine in its new location.

There probably will be some problems for the builder since he will be debugging the new production line or machine away from home, so to speak. But on the other hand, he will only be doing it once. It has been common practice to move a machine, tried and proven in the shop of the builder, to its spot at the customer's and again put it in running condition. The eliminating of one step should free plant space for the builders and give the user a better price.

Then, there's the other aspect of the builders' business—this too is on the credit side. What about the vast sales potential in small plants? There will be those who will have to be sold and then many who will jump at the opportunity to insure themselves against fast machine obsolescence by the use of this method of machine building.

Still another builder possibility is the builders' potential in used machinery sales. As the builder works with and/or for users he will certainly be in a good position to know what units are available and where. The price at which he will pick them up might not offer a great margin of profit, since depreciation will be low. But on the other hand, although the user will want to stockpile some of these units, he will not want to hold an unreasonable number of them. This could be very interesting for the enterprising builder.

THEY'RE SAYING . . .

H. C. Daum, Manager, Machining Process Department, Ford Motor Company, says . . .

"Until recently, it appeared that automation with its enormous investment in equipment might tend to freeze design . . . The large transfer machines, particularly those for machining large components, have been highly specialized and difficult to adapt to model and part design.

"The so-called 'unitized automation' would encourage incorporation of technological advancements and product design changes which benefit the buying public since the flexibility of equipment will make the changes less costly.

"The Building Block concept also appears to be the answer to extending the automatic production line into new areas of industrial use, since purchase of the new equipment will be more economically practical for smaller companies."

R. L. Witsche, General Supervisor, Mechanical Engineering Research, International Harvester, says . . .

"Working together, Ford, Chrysler, General Motors, International Harvester, and the major machine tool builders developed these Standards for Building Block construction. Their purpose is to reduce rework and retooling costs, combat premature machine tool obsolescence, and provide versatility. They will also make possible interchangeability of equipment made by one manufacturer with that of another.

"I suppose increased life expectancy of a machine tool is one of the biggest things to come out of these Standards. When we have need of new equipment, of the type we have been discussing, appropriations should be much easier to come by from now on.

V. A. Williams, Automation Consultant, Chrysler Corporation, says . . .

"We have had good cooperation from the machine tool builders. They have contributed a great deal. As a matter of fact, everyone has been so genuinely interested that cooperation has been phenomenal.

"The smaller sizes of machine components should encourage small industry to use this type of equipment. I think this will be one of the big benefits. It will help those with very limited capital to get in and produce with this type of equipment."

Some Questions You Might Ask

1. *Will there be a limit to the number of stations around a dial type machine?* No, the number of stations on a dial main base will be dictated by the intended use of the base. In other words, the number of stations provided will be determined by the processing of the part. The number of operations to be performed will in turn be one of the factors that establish the machine's diameter and the number of stations that can be accommodated.

2. *Will the addition of a loading station be one of the standard stipulations?* No, this depends on the machine requirements and the builder.

3. *Can you intermix components from one size group with those of another size group?* This is not provided for in the Standards. That is, the hole patterns for all size groups are not provided on each main base that could accommodate them. The keyways are the same throughout all group sizes, and in all cases they are to be let in at the same height from the floor. Since there's plenty of undisturbed area on a main base attaching face between the #5 hole pattern extremes (the #5 group size is the large one), it only remains to transfer the hole pattern of any of the smaller size wing bases in order to attach them. To pick up the theoretical center line, when using a smaller group size wing base on a larger group size main base, a spacer will have to be used between the vertical key and the side of the wing base. This spacer will be half the difference between the width of a wing base from the main base group size and the width of the wing base to be attached.

4. *On the dial type main bases, are the keyways around the periphery standard?* Yes, they are a standard size but their location is not standard. This is left up to the demands of the customer and the design of the supplier. It should be noted, however, that this cylindrical face and its machining has nothing directly to do with the mating surfaces of the wing bases; the wing bases are mounted to adapter standard faces. The adapters in turn are mounted to the dial base by "T" bolts. This "T" bolt face of the adapter and the periphery of the dial are peculiar to each other but not necessarily standard.

5. *In what instances will the vertical column components be made integral with the wing bases?* In cases where extra rigidity is required, or where alignment might be extra critical, or where an abnormal or difficult setup is required.

6. *What's the difference between a transfer and a shuttle?* A transfer machine, briefly, takes a part or series of parts through a number of stations for the completion of the number of operations it's designed for; while a shuttle machine shuttles a part into a work position, and then either back out or out the other side of the machine. The method of transfer or shuttle is not a criteria.

7. *How was the standard working height established?* Establishing a

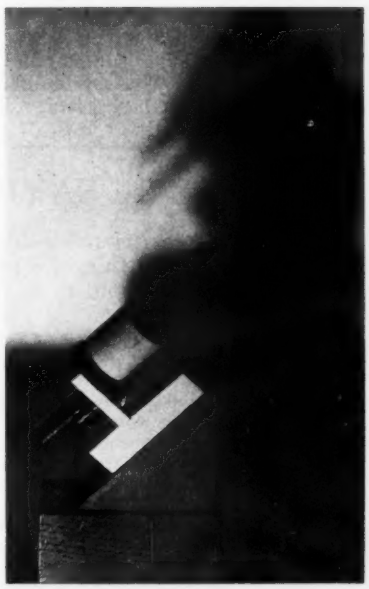


Fig. 4. Modules of the same size class, as in Figure 3, are interchangeable in effecting moduvation. The angular column has the same mounting hole pattern as a feed unit and can be attached to a wing base in any of three positions. The top surface of any angular column will accept any feed unit within its size class.

Under the Standards the inclination of a column's feed unit mounting surface is not fixed; the angle being made "to suit" the job.

In the proposed Standards it will be noted that two sizes of angular columns are standardized within each machine size classification. This permits either short or long feed units.

Fig. 5. A vertical column attached to a main base. Its abutting surface is standardized for the respective main base size, and the column here is integral with its own base. This is for extreme rigidity. There can be more versatility in having a vertical column sit on top of a standard wing base, because the wing base may be re-usable for other moduvating while the vertical column is shelved for less frequent use.

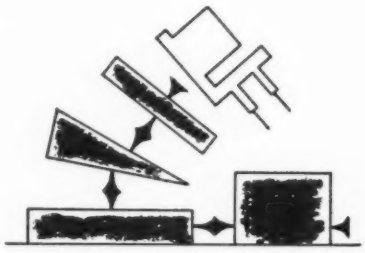
There are two variations in vertical column attaching surfaces for moduvated tooling: There will be columns with the standardized surface, as shown, to which a feed unit of appropriate size is attached; and there will be the standard columns having integral ways. These columns will also be standardized in the five sizes.

working height for main bases was one of the most controversial areas of the Standards' development. There were those who wanted low working heights, and this would be advantageous from the standpoint of more latitude for work in this area. But, there were difficulties here from the standpoint of adding enough "beef" in the larger sizes. So it, like all items of standardization, was established by arbitration.

8. *Is it in keeping with the Standards to have horizontal angle adapters, for instance, an integral part of the wing base?* Yes, if you have need for ultra-precise machining or location it might be advantageous to have less joints. Or, if conditions like heavy milling call for extreme rigidity, it can be had this way. This integral construction is optional and entirely up to the buyer and builder at the time of purchase.

9. *Why is the top angle of an angle column left to the discretion of the buyer or builder?* First thoughts on this seemed to indicate that standard angles would be used. But there are so many angle possibilities that it would be difficult to establish appropriate increments, so it seemed a better plan to let them all be special. After all, product design establishes the angle, and it would be better not to hamper the designer with standard angles.

10. *Has any provision been made for running conduit and piping through these standard components?* Yes, on the wing bases a raceway has been planned.



Indicated Surfaces Standardized. Other Components Not Symbolized Have Similar Standardization.

11. *What provision has been made for the removal of chips?* The only consideration in regard to chip removal has been the height of the main bases. Working height will be high enough to accommodate the various chip conveyors available.

12. *What about components for the buildup of machines smaller than Size 1 and larger than Size 5?* Any machine that exceeds either extreme will be considered a special.

13. *Will other sizes be added?* This is always a possibility, and it can more easily be taken care of after Standards for the first five sizes are established.

14. *How will a user be protected when a machine rebuilt by one builder is made up from machines originally supplied by another builder?* It would seem that the rebuilt machine should be guaranteed by the company that rebuilds it.

15. *How will the legal problems be resolved; those concerning reworking the machine components of another supplier under contract with the new owner-user? What about infringement of patent rights?* This seems to be no problem. As a general rule, the sale of a patented device carries with it the right to use and repair. This doesn't give the purchaser the right to rebuild unless this right is expressly granted, but since this is usually granted in the conditions of a purchase order, there should be little difficulty.

16. *Will main bases be interchangeable?* Because transfer and shuttle mechanisms will be special tooling, applicable in most instances to a specific job only, these Building Blocks will not be as readily interchangeable as others. The feasibility of re-use of these components will depend on the cost of rework compared to purchase of another base.

The Standards follow on pages 41 through 47.

Reprints of this article, with finalized Standards included, will be available from Tooling & Production. Circle W-1 on the Inform-A-Gram card if you'd like a copy.

THEY'RE SAYING . . .

K. C. Butterfield, Staff Master Mechanic of Chrysler Corporation, says . . .

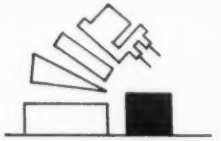
"The participation of Chrysler in this endeavor started about two years ago. Ford started the project and has been the coordinator, and since we had this common problem —a need for standardization of single station and multi-station machines—we were pleased to cooperate.

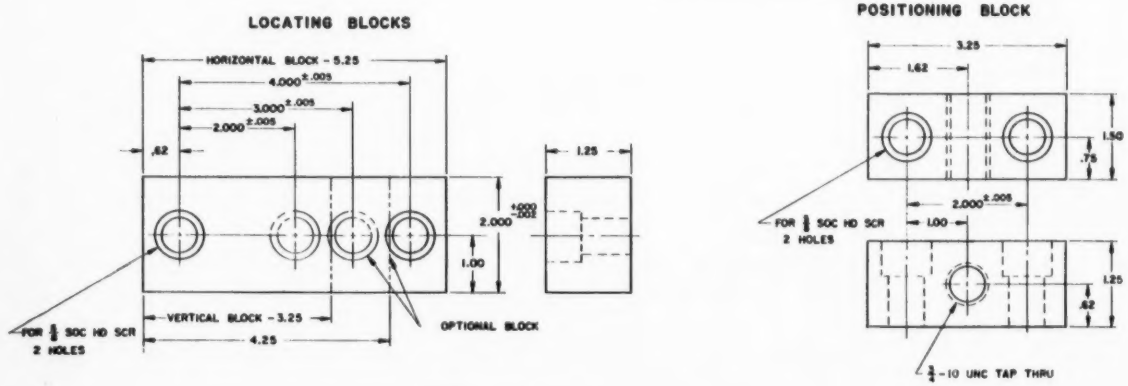
"Even now though, before these new Standards take hold, we have been stockpiling certain machine components for re-use through our suppliers. We have used certain components already; mainly this has been due to careful selectivity of shelved items. Those that don't lend themselves to this program we scrap. Our experience here will help us when we get real standardized components to save.

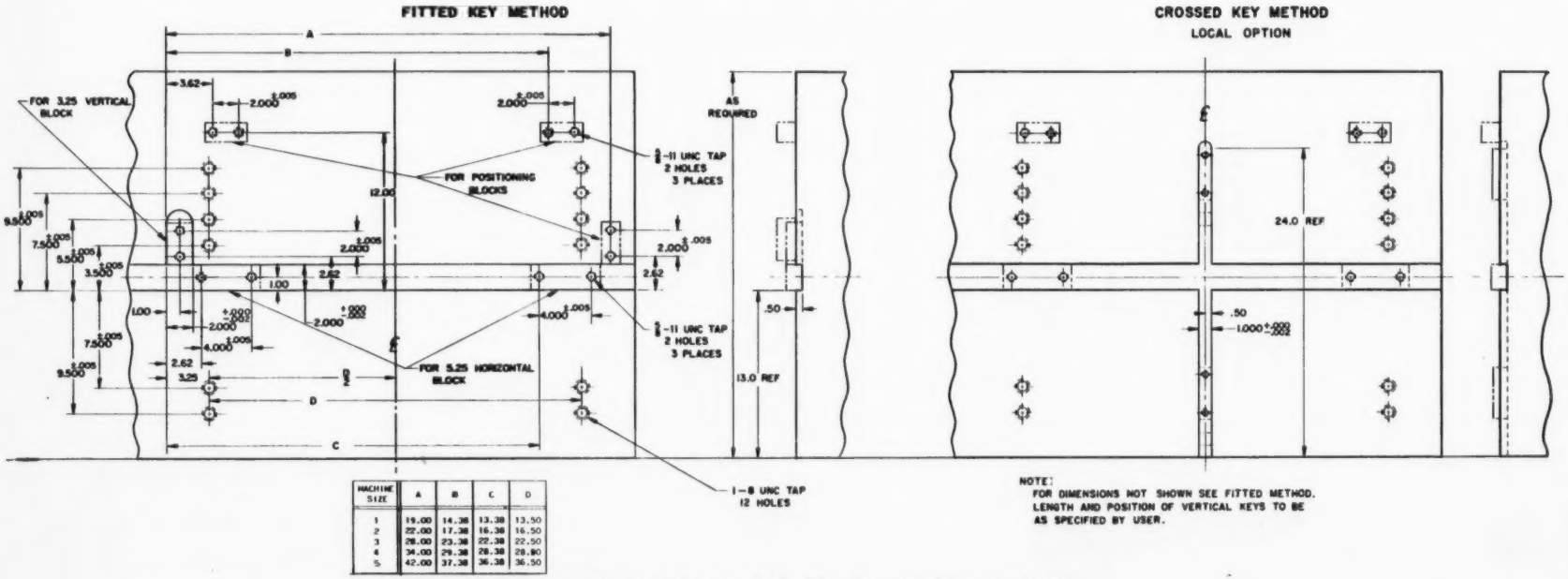
W. D. Bryson, Manager, Mfg. Res., International Harvester Co., says . . .

"The advantages to be gained from using the Building Block construction are: Improved interchangeability of machine tool components, lower cost rearrangement of components, economical modification of machine tools to accommodate model changes, improved flexibility, low cost and speeded up repairs, reduced inventory of repair parts, and maximum utilization and increased life-expectancy of machine tools."

MAIN BASE TWO-STATION



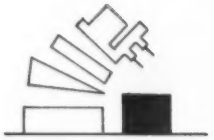




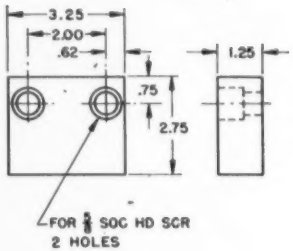
MACHINE SIZE	A	B	C	D
1	19.00	14.38	13.38	13.50
2	22.00	17.38	16.38	16.50
3	28.00	23.38	22.38	22.50
4	34.00	29.38	28.38	28.80
5	42.00	37.38	36.38	36.50

Showing: The block (key) method of locating wing bases; positioning blocks with adjusting screws; and specifications for an optional locating method, (crossed keys). The base provides a surface height of 42" for tooling or workpiece. The bases are to be available in five sizes. All other dimensions to be agreed upon by builder and user.

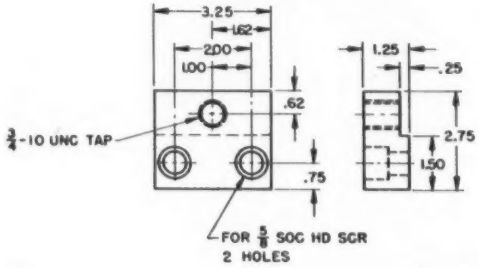
MAIN BASE SINGLE STATION

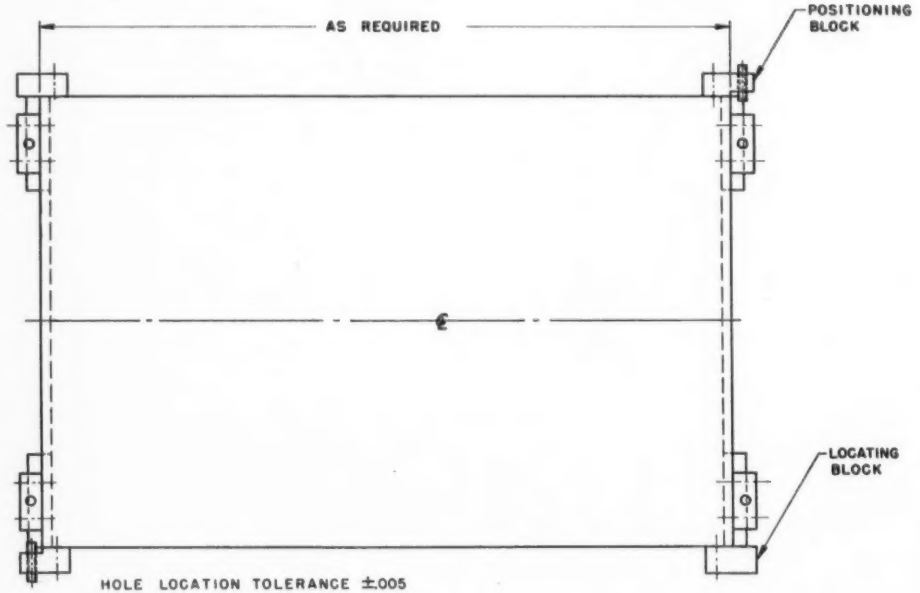


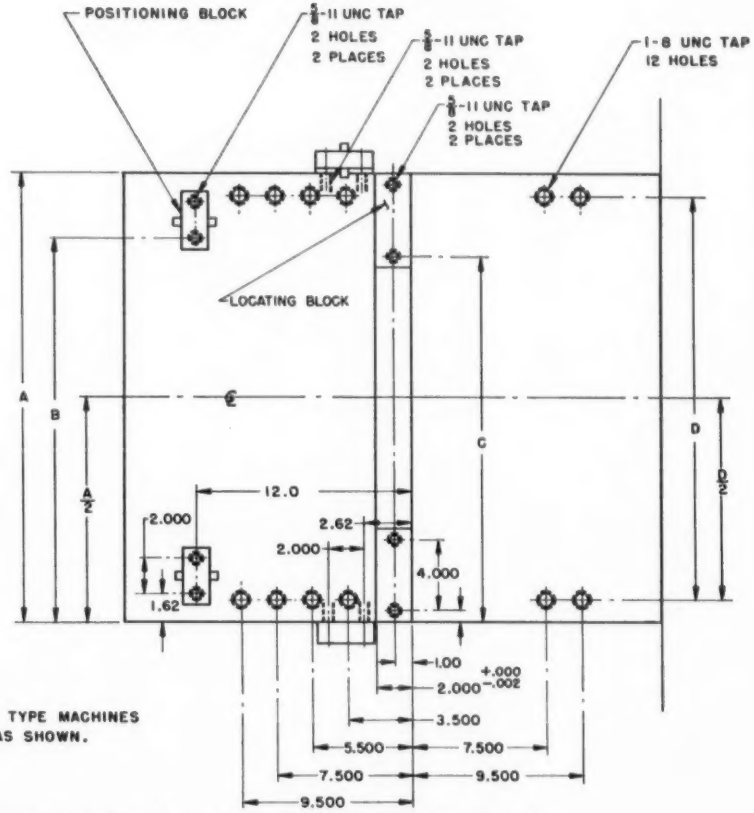
LOCATING BLOCK



POSITIONING BLOCK







HOLE LOCATION TOLERANCE ±.005

MACHINE SIZE	A	B	C	D
1	16.00	12.38	11.38	13.50
2	19.00	15.38	14.38	16.50
3	25.00	21.38	20.38	22.50
4	31.00	27.38	26.38	28.50
5	39.00	35.38	34.38	36.50

NOTE: ONE AND MULTIPLE WAY TYPES AND TRUNNION TYPE MACHINES TO HAVE WING BASE ATTACHING SURFACES AS SHOWN.

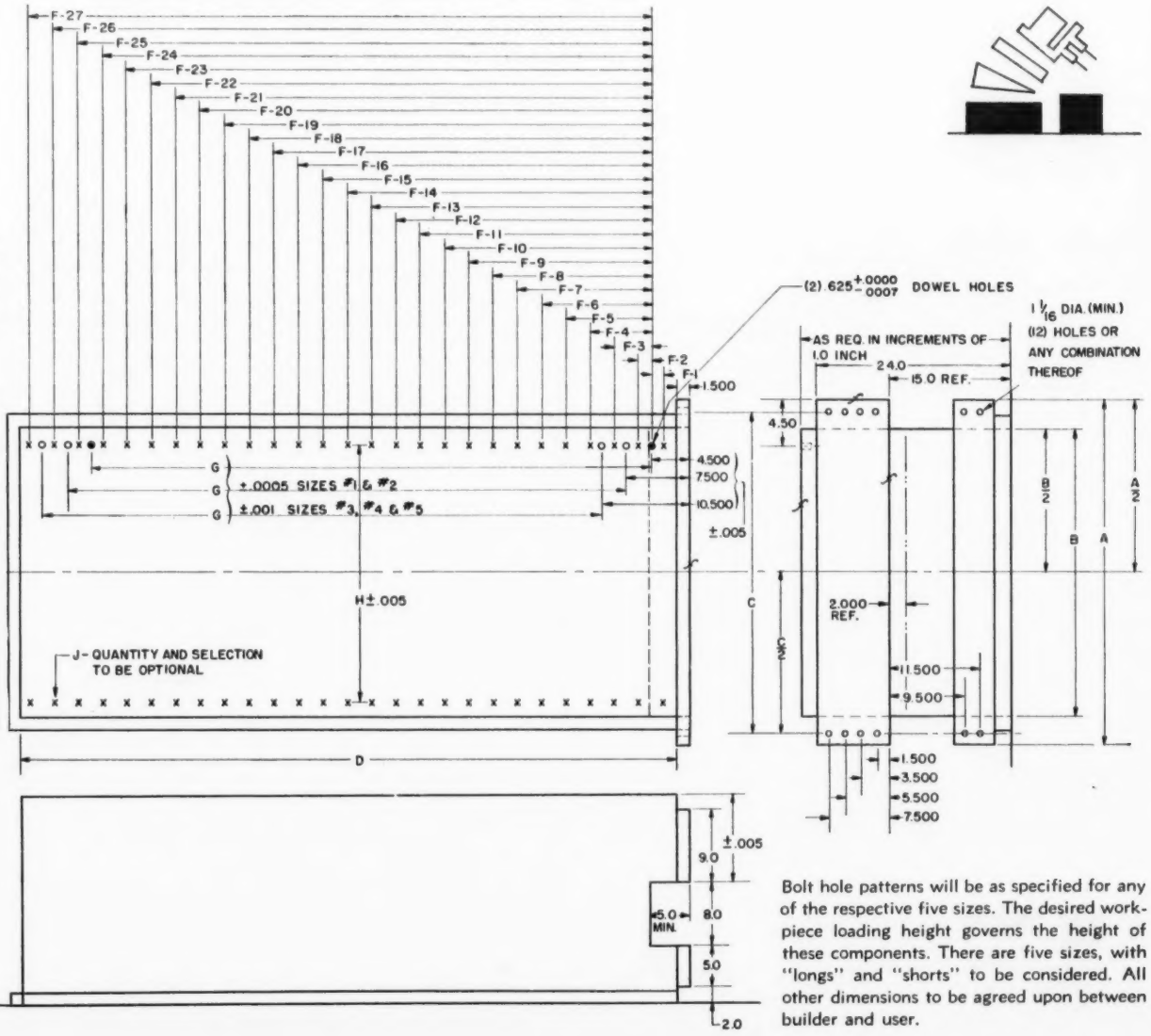
Main bases will be provided with applicable standard bolt hole patterns and location methods. All bases are to be built to provide 42" tooling or workpiece height. Any dimensional deviations are to be agreed upon by the builder and purchaser. These bases are to be available in five sizes. All other dimensions to be agreed upon by builder and user.

terns and location methods. All bases are to be built to provide 42" tooling or workpiece height. Any dimensional deviations are to be

available in five sizes. All other dimensions to be agreed upon by builder and user.

WING BASE SHORT (SEE NOTE FOR LONG)

	MACHINE SIZE				
	1	2	3	4	5
A	16.00	19.00	25.00	31.00	39.00
B	11.00	14.00	20.00	26.00	34.00
C	13.500	16.500	22.500	28.500	36.500
D	36.00	45.00	63.00	75.00	81.00
F-1	1.500	1.500	1.500	1.500	1.500
F-2	1.500	1.500	1.500	1.500	1.500
F-3	4.500	4.500	4.500	4.500	4.500
F-4	7.500	7.500	7.500	7.500	7.500
F-5	10.500	10.500	10.500	10.500	10.500
F-6	13.500	13.500	13.500	13.500	13.500
F-7	16.500	16.500	16.500	16.500	16.500
F-8	19.500	19.500	19.500	19.500	19.500
F-9	22.500	22.500	22.500	22.500	22.500
F-10	25.500	25.500	25.500	25.500	25.500
F-11	28.500	28.500	28.500	28.500	28.500
F-12	31.500	31.500	31.500	31.500	31.500
F-13		34.500	34.500	34.500	34.500
F-14		37.500	37.500	37.500	37.500
F-15		40.500	40.500	40.500	40.500
F-16			43.500	43.500	43.500
F-17			46.500	46.500	46.500
F-18			49.500	49.500	49.500
F-19			52.500	52.500	52.500
F-20			55.500	55.500	55.500
F-21			58.500	58.500	58.500
F-22				61.500	61.500
F-23				64.500	64.500
F-24				67.500	67.500
F-25				70.500	70.500
F-26					73.500
F-27					76.500
G	24.000	33.000	51.000	63.000	69.000
H	7.000	10.000	16.000	22.000	30.000
J	1/2-13 UNC	1/2-13 UNC	5/8-11 UNC	5/8-11 UNC	5/8-11 UNC



NOTE: SELECTION OF HOLES TO BE OPTIONAL. ORIGINAL VENDOR TO MACHINE ONLY THOSE HOLES REQUIRED FOR MOUNTING PURPOSES. ALLOWABLE TOLERANCES ±.005.

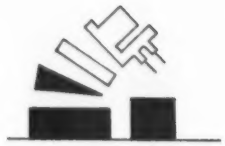
THRUST FACE OF WING BASE LOCATING SURFACE TO BE PARALLEL WITH MOUNTING SURFACE WITHIN .002.

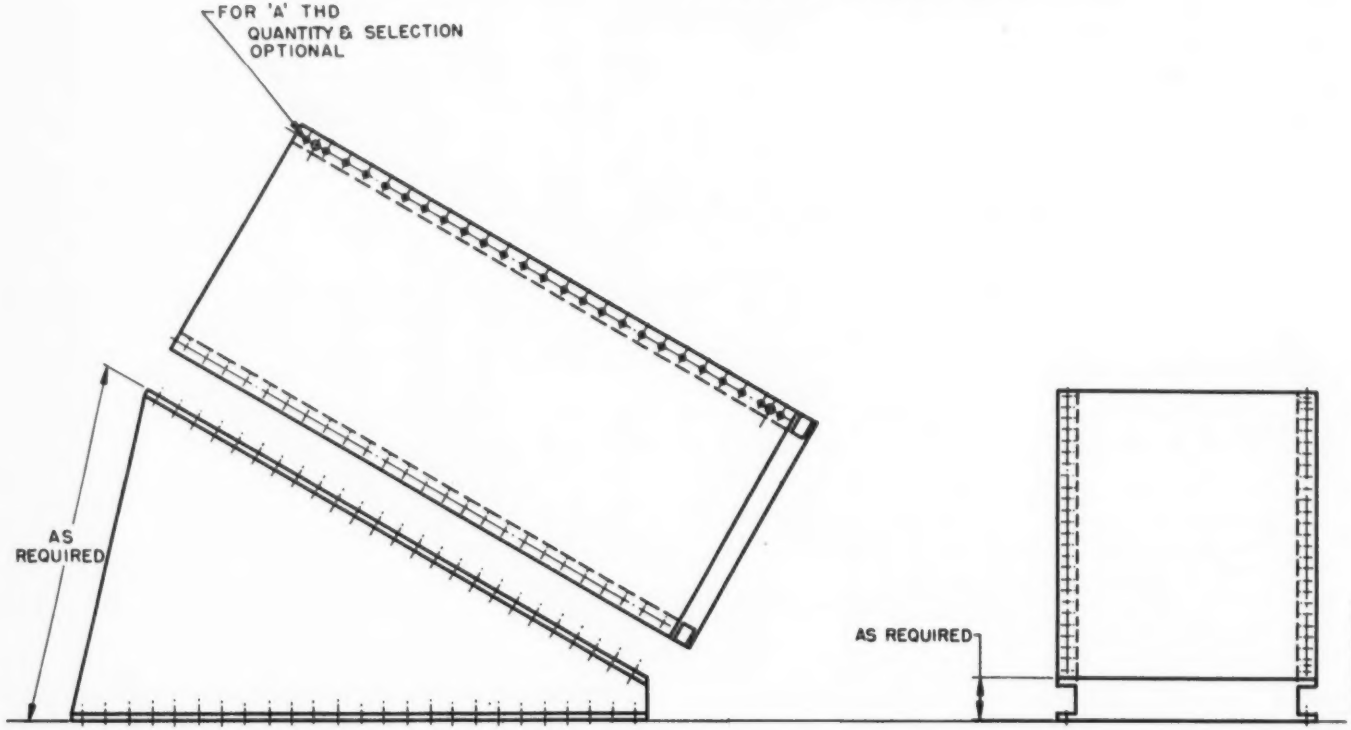
MAIN BASE ATTACH SURFACE MUST BE SQUARE WITH CENTER LINE OF DOWEL HOLES.

LENGTH OF WING BASE (D) SHOWN FOR SHORT FEED UNITS ONLY. LENGTH OF WING BASES REQUIRED FOR LONG FEED UNITS = LENGTH OF FEED UNIT +7.50.

Bolt hole patterns will be as specified for any of the respective five sizes. The desired workpiece loading height governs the height of these components. There are five sizes, with "longs" and "shorts" to be considered. All other dimensions to be agreed upon between builder and user.

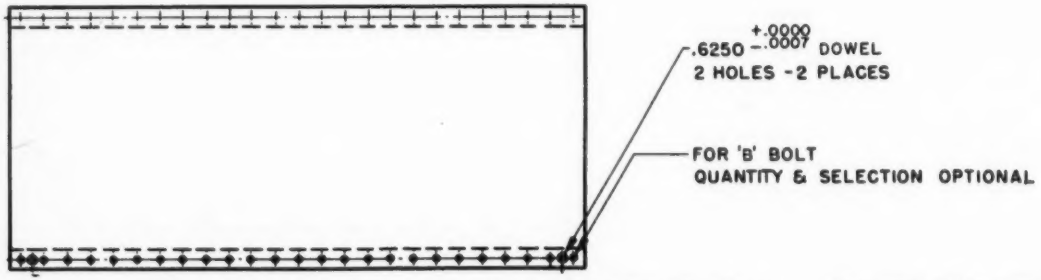
ANGULAR COLUMN





MACHINE SIZES	A	B
1	1/2-13 UNC	1/2
2	1/2-13 UNC	1/2
3	5/8-11 UNC	5/8
4	5/8-11 UNC	5/8
5	5/8-11 UNC	5/8

NOTE: LOCATION OF DRILLED AND TAPPED HOLES TO BE SAME AS CORRESPONDING FEED UNIT MOUNTING HOLES SHOWN FOR WING BASE, ALLOWABLE TOLERANCE ±.005.



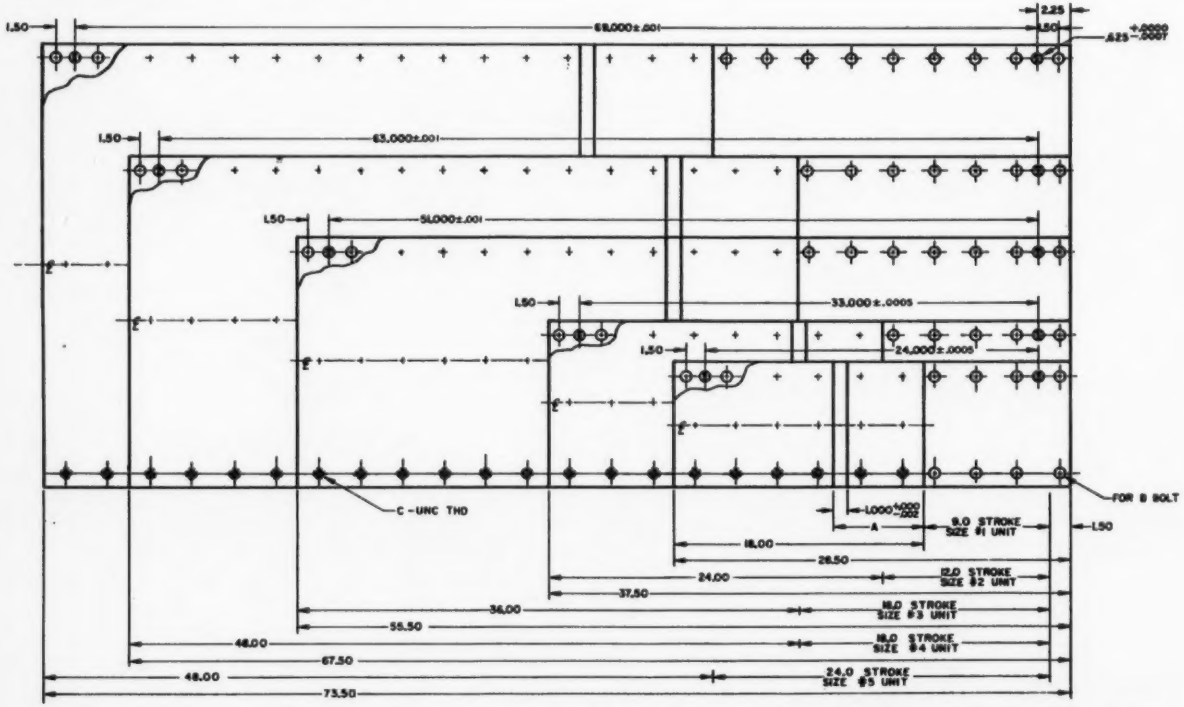
This module will be built in five sizes, having angles "to suit" a specific operation. Bolt hole patterns, top and bottom, are to be taken from the feed unit and wing base Standards. When necessary, these may be floor mounted units, abutting and bolted to main bases just as wing bases are (taking mounting dimensions from wing base specs). Other dimensions to be agreed on between builder and user.

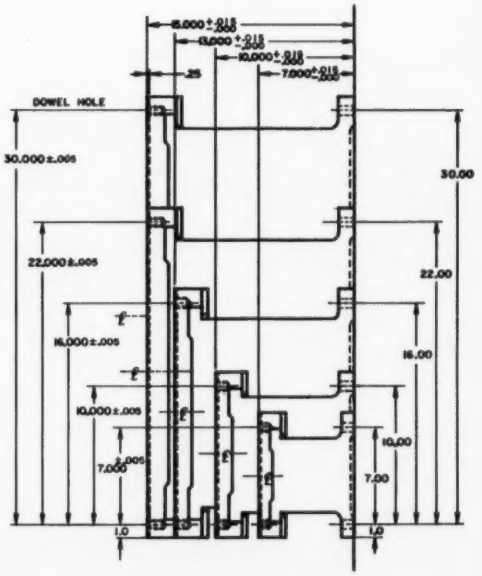
FEED UNIT WAY TYPE, SHORT (SEE TABLE FOR LONG)

specific operation. Bolt hole patterns, top and bottom, are to be taken from the feed unit and wing base Standards. When necessary, just as wing bases are (taking mounting dimensions from wing base specs). Other dimensions to be agreed on between builder and user.

FEED UNIT WAY TYPE, SHORT (SEE TABLE FOR LONG)

MACHINE SIZE	A	B	C	LONG UNIT			
				PLATEN LENGTH	STROKE	BASE LENGTH	DOWEL C.D.
1	6.50	1/2	1/2-13	36.00	18.00	55.50	51.000
2	6.50	1/2	1/2-13	36.00	18.00	55.50	51.000
3	9.50	5/8	5/8-11	48.00	30.00	79.50	75.000
4	9.50	5/8	5/8-11	48.00	30.00	79.50	75.000
5	9.50	5/8	5/8-11	48.00	40.00	89.50	85.000





NOTE:
SELECTION OF HOLES TO BE OPTIONAL. ORIGINAL VENDOR TO MACHINE ONLY THOSE HOLES REQUIRED FOR MOUNTING PURPOSES. HOLES TO BE LOCATED AT JUNCTION POINT OF GRID LINES, ALLOWABLE TOLERANCE ±.005.

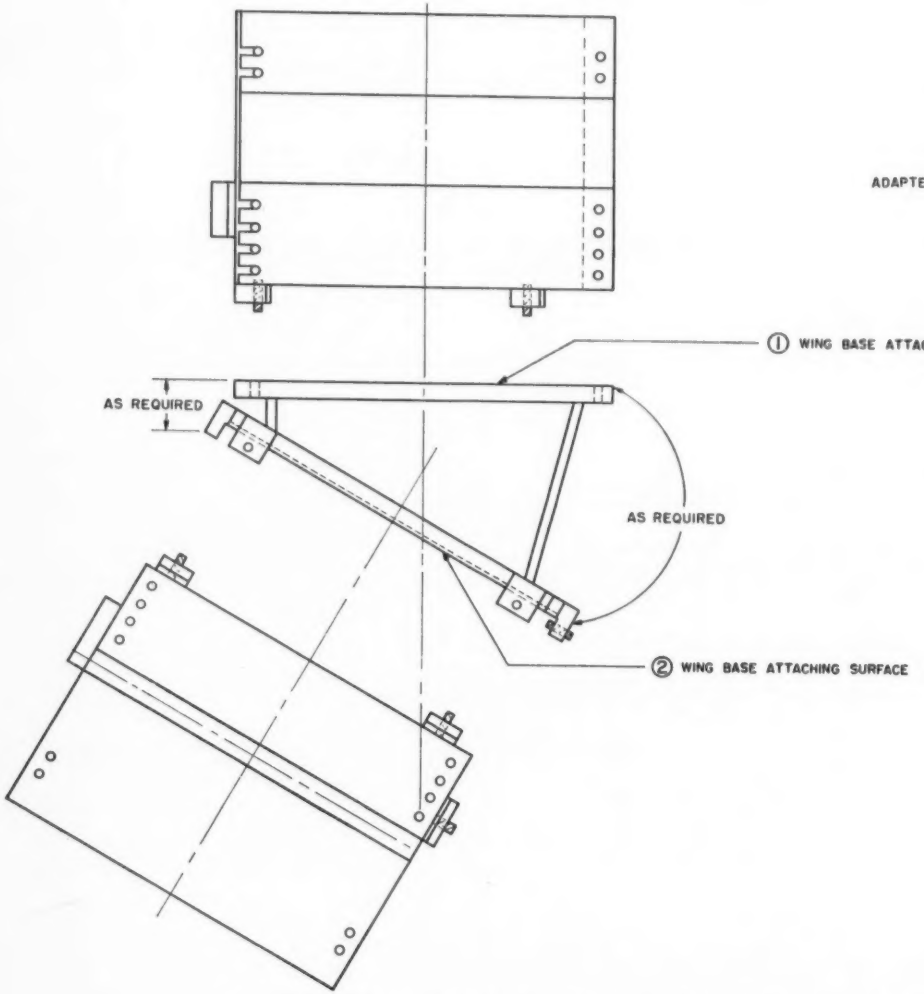
THRUST FACE OF KEYWAY SHALL BE SQUARE WITH CENTER LINE OF DOWEL HOLES.

CENTER LINE OF DOWEL HOLES SHALL BE PARALLEL WITH WAYS.

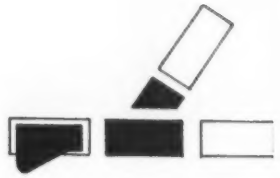
LENGTH OF FEED UNIT BASE = LENGTH OF PLATEN + LENGTH OF STROKE + 1.50.

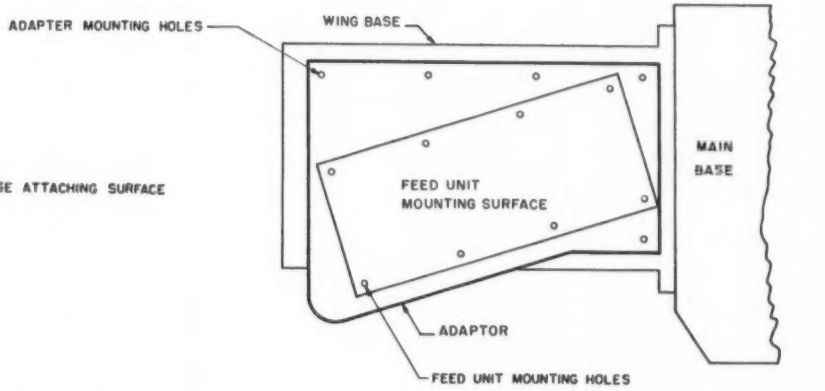
This module will be available in five sizes. Mounting surface, bolt hole patterns, size of wing base attaching surface, and height of the tool holder mounting surface (platen) will be as specified. Holes for securing tooling to platen will be located on junction lines shown, in increments divisible by three. All other dimensions to be agreed upon between builder and user.

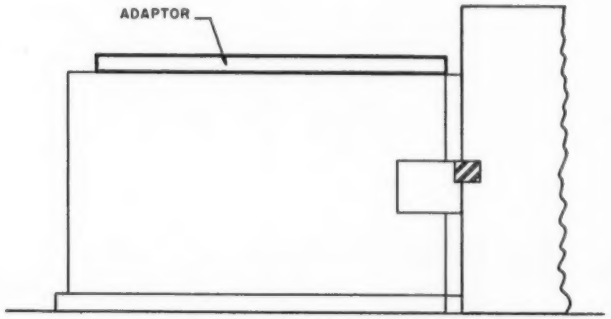
HORIZONTAL ANGLE ADAPTER



This module will be made in the five sizes, in keeping with the related wing base with angles as needed. Also, it may be integral with wing bases (slant-topped wing bases).







Alternate adapter plate on right will conform to feed unit and wing base sizes, and mounting hole specifications will be compatible. All other dimensions to be agreed upon between builder and user.

OTHER STANDARD AREAS USING SAME DIMENSIONAL RELATIONSHIPS

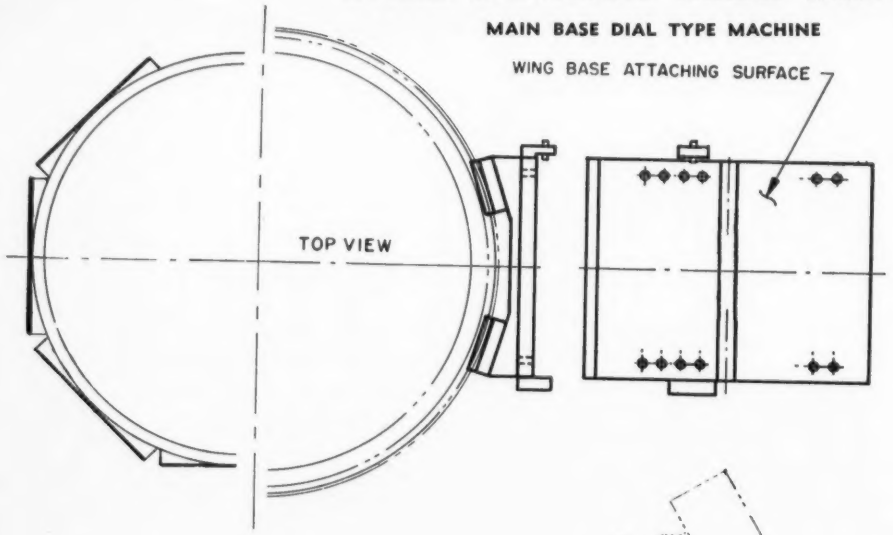
MAIN BASE DIAL TYPE MACHINE

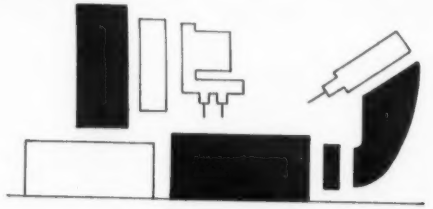
wing bases (slant-topped wing bases).

other dimensions to be agreed upon between builder and user.

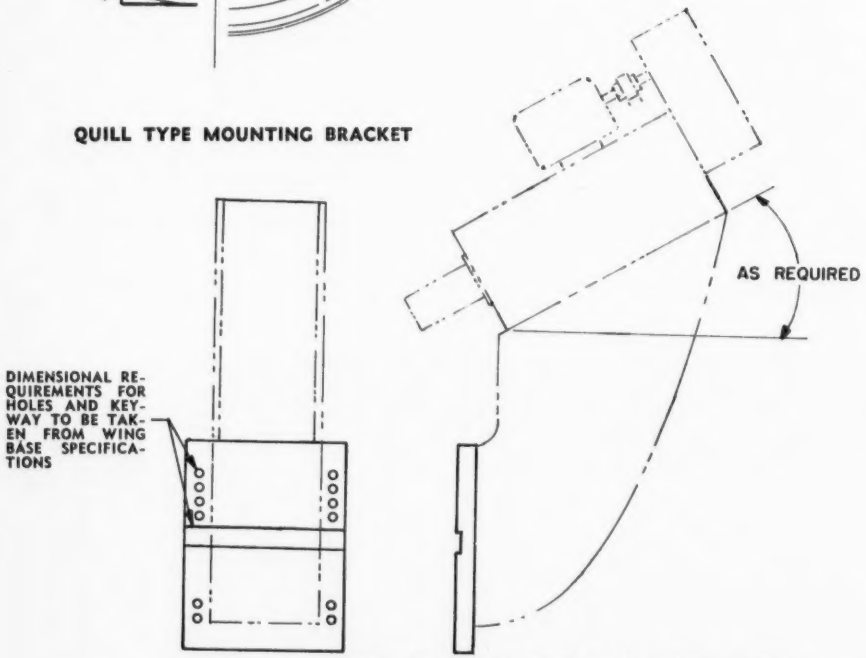
OTHER STANDARD AREAS USING SAME DIMENSIONAL RELATIONSHIPS

MAIN BASE DIAL TYPE MACHINE





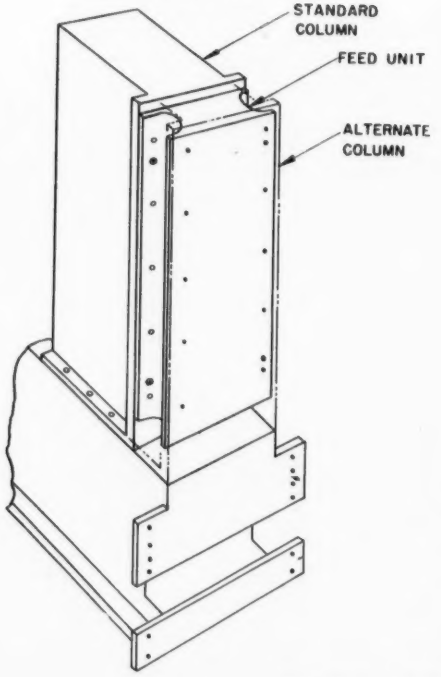
QUILL TYPE MOUNTING BRACKET



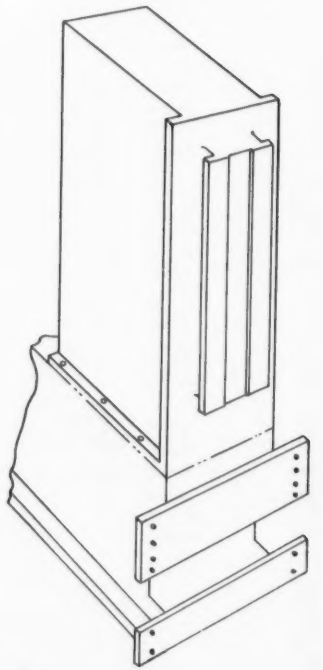
The wing base adapter, for use with round dial-type bases, is available in the five sizes related to wing bases. Its main base attaching faces meet main base specifications. Its only rigid specification is that attaching bolts be standard 1" T-bolts.

The dial-type main base may have either T-slots or standard integral faces accepting wing bases. With T-slots, angle adapters are used.

FEED UNIT TYPE



INTEGRAL WAY TYPE



VERTICAL COLUMNS

In compliance to the Standards, the workpiece mounting surface will be 42" from the floor.

Quill mounting brackets are self-explanatory.

Vertical columns are also self-explanatory, but it should be noted that these can be integral with a wing base attachment.

All other dimensions to be agreed upon between builder and user.

HEAT TREATING TODAY — Third of a Series

THE METALLURGY OF HEAT TREATING

. . . An Inside (the metal) Job

Heat, hold, and cool — these are the key words which describe how heat treaters change the properties of steel to suit the needs of industry. An understanding of the metallurgical principles behind these words helps provide a foundation for specifying heat treating.

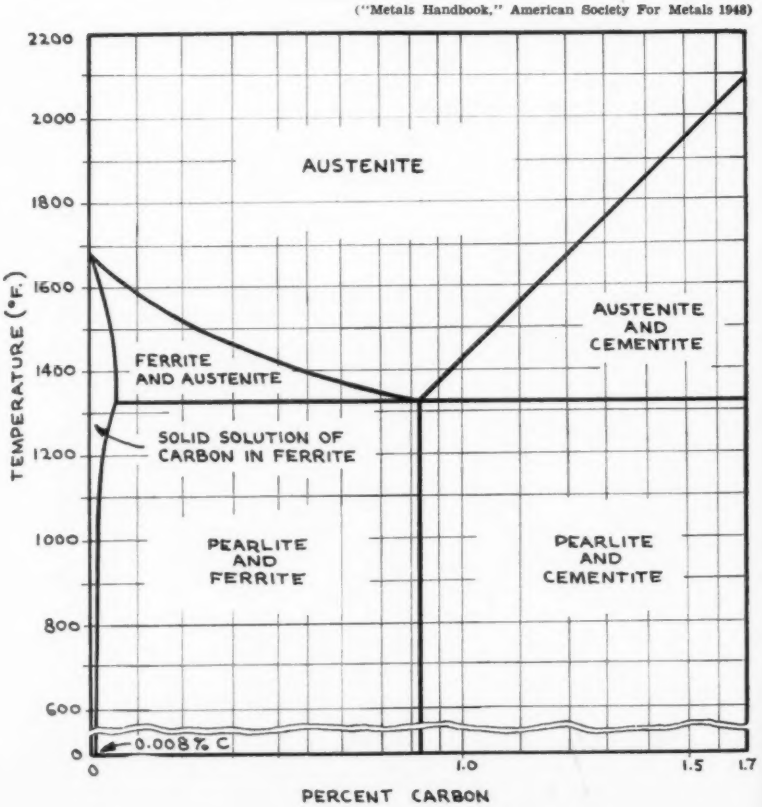
DESIGNERS AND PRODUCERS of metal products are fortunate to have such a versatile material as steel at their disposal. Many different grades are available for a variety of applications, and a wide range of properties is possible for each grade. This flexibility stems from the ingredients of steel and their sensitivity to changes in temperature.

Iron, carbon, and alloying elements combine in a given steel to form a characteristic internal structure which determines the outward mechanical properties. Controlled variations in temperature can cause changes in this iron-carbon aggregate and thus in the properties as well. Therefore we can utilize heat treatments to soften materials for easier machining and to harden them for greater wear resistance and increased strength.

Steel is basically a solid solution of iron-carbon compounds in pure iron. The amount of carbon that is soluble in iron increases as the tem-

by Lester F. Spencer
Metallurgist
ALLIS-CHALMERS MFG. CO.
Milwaukee, Wisconsin
and Charles Weiner
Assistant Editor

Fig. 1. Iron-carbon equilibrium diagram.
("Metals Handbook," American Society For Metals 1948)



perature is changed. In this solid solution the hard carbide is dissolved in the soft iron, and the way in which it comes out of solution determines the mechanical properties of the steel. Heat treatments of steel are based on the low solubility of carbon in iron at low temperatures and its high solubility at high temperatures.

As steel is heated from room temperature the structure changes as certain temperatures are reached. These changes take place at different temperatures for steels of different carbon content.

Iron-Carbon Diagram

The iron-carbon diagram (Fig. 1) is a "scorecard" which identifies the different structures and the temperatures at which they change. It is based on the changes that would occur if it were possible to heat and cool the steel at very slow rates. Although practical heating and cooling rates are much faster, the diagram is useful because it indicates the limiting ranges for the different structures.

A 1040 steel, which corresponds to 0.4% carbon on the diagram, has a structure of ferrite and pearlite at room temperature and up to 1335°F (cherry-red color). Ferrite is relatively pure iron and pearlite is a mixture of ferrite and an iron-carbon compound called cementite. When the steel is heated above 1335° F, all of the pearlite changes to austenite, which is a solid solution of carbon in a form of pure iron. As the temperature increases between 1335° and 1450°F, the remaining ferrite also changes to austenite. Above 1450° F (bright red color), the steel is completely austenitic, and in this region all of the carbon is dissolved in the iron. As the steel is slowly cooled the changes are reversed until the original room temperature structure is reached.

A steel of higher carbon content, say 1065, will intercept the upper boundary line at a different temperature than grades containing less carbon. Alloying elements in the steel will cause a displacement of the boundary lines and a resultant change in the transformation temperature.

Hardening

When steel is heated and held above the transformation temperature to produce an austenitic structure, all of the carbon dissolves in the iron. If the steel is slowly cooled from this temperature the carbon comes out of solution. By speeding up the cooling rate the carbon can be retained in solution at a lower temperature. When the carbon finally comes out of solution at the lower temperature a new structure is formed, which is considerably harder than either austenite or the structure prior to heating.

If a steel containing sufficient carbon or alloying elements is immediately quenched in water or oil, the cooling rate will be fast enough to produce a very hard structure known as martensite. Slower cooling rates will produce structures which are less hard.

Metallurgists have studied the effect of time and temperature on the transformations and have developed diagrams relating these factors. These time-temperature-transformation (TTT) diagrams (Fig. 2) are guides which show the time necessary for a transformation to occur at a particular temperature. To get a particular structure and its related properties, the TTT diagram is checked and a hardening treatment which will meet the conditions outlined by the diagram is specified. By varying the speed and severity of the quench many different hardening procedures can be developed.

Tempering

The hardness caused by rapid quenching is also accompanied by brittleness and lack of toughness. To relieve the stresses caused by quenching and to restore ductility and toughness, the steel must be reheated or tempered (drawn) to a temperature somewhere below the transformation point in the range between 300° and 1200° F (steel has a dark cherry color in this range). As the tempering or drawing temperature is increased, ductility increases and hardness and strength decrease. The final hardness depends on the structure after quenching, temperature to which the steel is reheated, and amount of time it is held at that temperature.

Quenching Treatment	Usual Temperature Range of Bath	Quenching Media
Austempering	600°F-900°F	Molten Salt Molten Metal
Martempering	400°F-600°F 325°F-450°F 200°F-350°F	Molten Salt Molten Salt, Oil Oil
Conventional Oil	100°F-170°F	Oil
Water	60°F-100°F	Water, Brine Caustic, Etc.

TABLE I

Once the most desirable combination of hardness, strength, and ductility is chosen the corresponding time-at-temperature cycle can be selected. In short, the quench and temper technique of hardening consists of heating above the transformation temperature, holding at that temperature until austenite is completely formed, cooling rapidly enough to form martensite, and finally, reheating to modify the properties.

Austempering

In recent years the method of rapid cooling at a constant rate, has been modified so that a suitable hardness could be realized with a minimum of distortion and internal stresses. Instead of rapidly cooling the steel directly to a much lower temperature, it is first cooled to an intermediate temperature where it is held for a specified time, and from there cooled to room temperature. This cooling in constant temperature steps causes less internal stresses in the steel.

In the austempering process, a steel is heated to produce an austenitic structure, and transferred to a hot bath which is kept at a temperature high enough to prevent formation of martensite. The temperature at which martensite begins to form is known as the M_s temperature and can be determined from the TTT diagram previously mentioned. As the steel is held in the constant temperature bath, a new intermediate structure, called bainite, begins to form. When the structure is completely transformed to bainite, the steel can be either water quenched or air cooled.

Since this transformation proceeds at a relatively slow rate and relatively high temperature, the residual stress level after transformation is rather low and distortion is held to a minimum. Thus, hardness is produced with less of the accompanying brittleness, and in many cases subsequent tempering is not necessary. As the temperature of the bath approaches the M_s temperature the "as-quenched" hardness increases. A prerequisite for austempering is that the steel contains sufficient alloy to slow down the beginning of transformation. Carbon steels in which the carbon content is at 0.60% and over, are usually limited to thin sections to obtain the desired bainite structure.

Specific examples of austempering cycles include: (a) Lawn mower blades made from AISI 1065 are heated in salt at 1550°F for six minutes, quenched in hot salt at 475° F for a six minute hold period, air cooled, and washed; (b) gears for electronic instrumentation made from AISI 6150 are heated at 1660° F for 30 minutes for a 120 lb load, quenched in salt at 580°F for a 30 min hold period, and washed. The hardness obtained on the lawn mower blades is between C48 and C52 and the gears have a hardness of C45.

Martempering

Another method of interrupted cooling is martempering. In this process the steel is quenched in a bath at a temperature near the M_s temperature. It is held in the bath until the temperature throughout the piece is uniform, but not long enough for transformation to bainite to start. The steel is then removed from the bath and cooled in air to room temperature. In this way the formation of martensite is delayed until all parts of the piece are at about the same temperature. The transformation then takes place uniformly throughout the cross section at a sufficiently slow rate to eliminate distortion and cracking. Subsequent tempering is necessary to

reduce brittleness. The material chosen for martempering should contain either alloys or sufficient carbon so that the beginning of the transformation to martensite is slowed down.

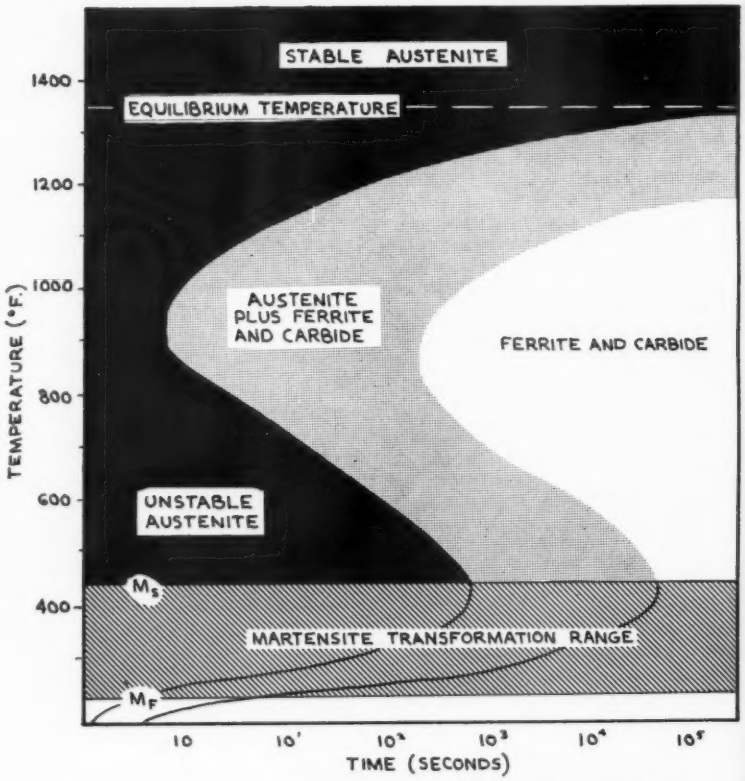
Table 1 compares the temperature ranges of different quenching treatments.

Annealing

Heating and cooling cycles can also be used to soften steels for maximum machinability and to relieve stresses set up by prior operations. The annealing treatments used for these purposes are based on the same principles as hardening operations. In annealing, the steel is heated above the upper transformation temperature and kept in this range until the transformation to austenite is complete. It is then cooled slowly in the furnace, or packed in an insulating material such as lime or ashes. The temperature to which it is heated depends on the amount of carbon in the steel and the degree of softening required.

The structure produced by annealing depends on the rate of continuous cooling. For example, a 1.15% carbon steel cooled from the austenite range at the rate of 900°/hr will have a hardness of Rockwell C18 with the structure containing considerable pearlite. To produce a structure in which the carbides are spheroidal in shape, the slower cooling rate of 20°/hr would be used. The final hardness will be about Rockwell C10 and the steel would be easier to machine.

A process known as cyclic annealing has been developed based on the isothermal transformation (TTT) diagrams. This short annealing cycle is useful since the conventional anneal for many medium and high alloy steels requires a great deal of time. In addition, cyclic annealing results in a closer control of structure so that the same structure can be reproduced day after day once a suitable time and temperature cycle has been established. This degree of uniformity is reflected in the decreased difficulty encountered in subsequent machining operations.



(From Surface Combustion Corporation)

Fig. 2. Time-temperature-transformation diagram (schematic). Time interval required for transformation of austenite to ferrite and cementite changes with temperature.

The procedure for this treatment is to heat the steel to a predetermined austenitizing temperature, rapidly cool to about 1100-1200°F, and hold at this temperature until the transformation to the desired structure is realized. The rate of cooling after transformation has been completed is not important. Both the temperature selected and the time of holding are functions of the material annealed and are determined by the isothermal diagram of the steel under consideration. The constant temperature cooling is done in a liquid bath or, where production rates are high, in specially designed continuous furnaces with isolated temperature zones.

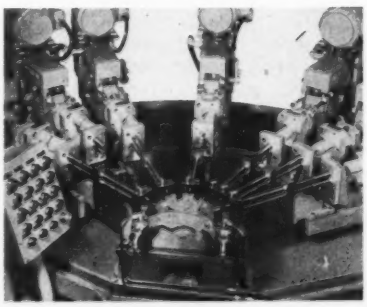
Some of the basic heat treatments which cause changes in the internal structure and properties of steel have been outlined in this article. Many modifications of these treatments are possible for different applications. The properties of steel may also be changed by surface treatments such as carburizing and nitriding. Applications of these surface treatments will be covered in a future article.

end

SEVEN DRILL UNITS COMBINED TO REDUCE SETUP TIME 700%

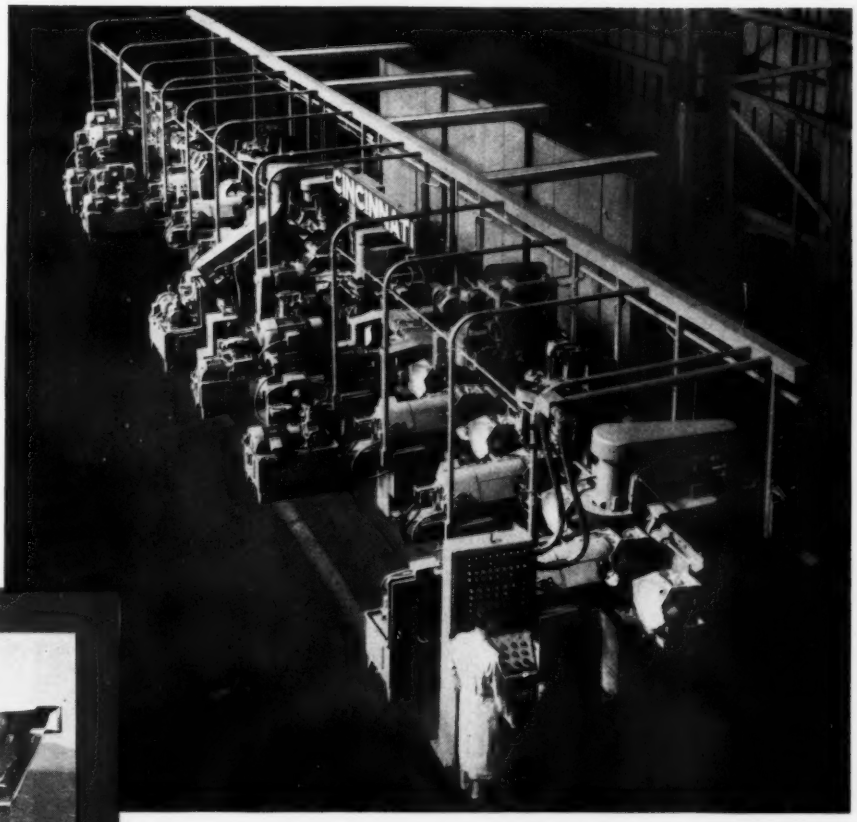
A setup of seven automatic drilling units producing 121 different hole patterns has reduced setup time 700% for a major supplier of automotive brake assemblies. This allows production of an additional 16,000 brake bands in the time normally lost.

Brake bands are fed into the fixture by the operator at the start of the operation, and from there on it's completely automatic. The self-contained hydraulic quill-type drilling units, products of Drillunit, Inc., can be moved left or right, and forward or back to obtain the desired hole pattern. Required depths are set by the stroke, which is held to an accuracy of ±0.0005" with an externally adjusted internal positive stop. An adjustment of one nut on each unit permits presetting of the angle gage.



Cincinnati 26-Station Unit Type Transfer Line

Mills, Drills, Bores . . . Ford Automatic Transmission Cases



At Ford Motor Company's new plant in Sharonville, Ohio, automatic transmission cases are automatically bored, milled and drilled in 33 machining operations. Accuracy and finish are excellent. The machine cycles 137 times per hour.

Inside the transmission case. Hard-to-reach surfaces are easily machined on the [illegible]

Transmission cases require gentle handling; firm, balanced clamping; experienced machining. All these requirements are incorporated in the CINCINNATI 26-Station Unit Type Transfer Line illustrated above. This production line mills, drills and bores Ford automatic transmission cases; inserts two bushings; automatically banks excess parts; transfers the casting from one station to the next. Several outstanding advantages are incorporated in this line, including unit construction and complete static electrical control.

Cincinnati builds special machine tools and complete production lines varying in complexity from small bearing-shell broaching machines to giant production lines performing a multitude of operations. Make Cincinnati your first choice for equipment of this type. Our Automation Specialists are ready to serve you.

The Cincinnati Milling Machine Co., Cincinnati 9, Ohio

CINCINNATI

SPECIAL MACHINES • BROACHING MACHINES • COMPLETE PRODUCTION LINES

CINCINNATI®
SPECIAL MACHINE DIVISION

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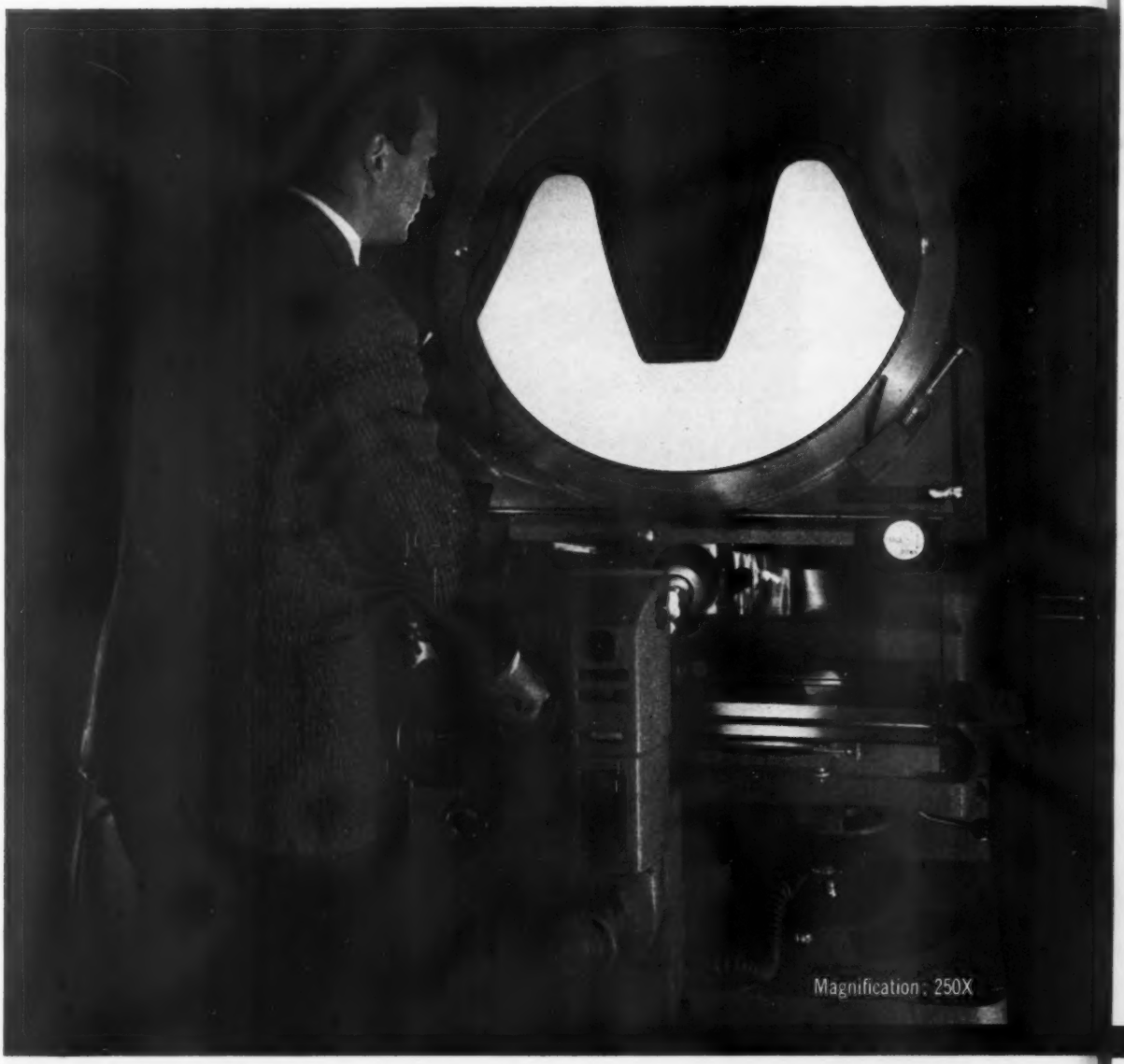
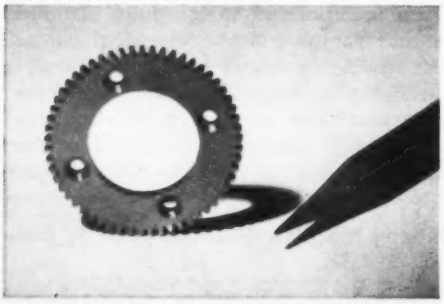


See the sharpness of the shadow produced by a Mercury Arc Lamp!



This photo shows the sort of shadow you get with a Mercury Arc Lamp. Note the extreme sharpness of the shadow image's definition, even at 250 magnifications. This unprecedented sharpness means greater precision, greater efficiency in your inspection and measurement operations.

◀ Note the actual size of this gear, which is enlarged for inspection on the FC-30 Comparator screen. Gear has 57 teeth, and has 1.1159″ dia. base circle.

IMPORTANT NEWS

for all users of J & L Optical Comparators!

Jones & Lamson introduces the J & L MERCURY ARC LAMP

. . . a revolutionary new light source

that makes your optical inspection more precise,

more efficient than ever before!

This new J & L light source unit gives *more than 5 times the intensity of the best filament light source available today.*

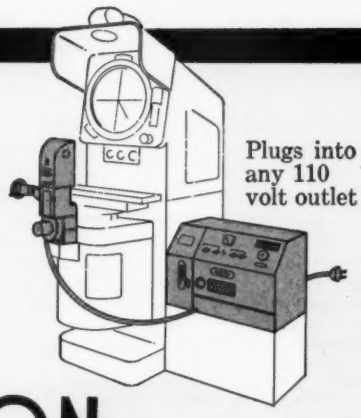
The light produced by the J & L Mercury Arc Lamp is actually a *new* kind of light . . . **you get a *steady* arc, with *no* flickering.** Its high intensity produces an incomparably bright screen with razor-sharp black shadow even at highest magnifications. Thus, accuracy of inspection and measuring is increased enormously. Now, you can literally "split tenths" with your J & L Comparator! (For use at low magnifications, the Mercury Arc light can be filtered readily.)

The J & L Mercury Arc Lamp comes as a complete packaged unit that is quickly interchangeable with the standard light source on any J & L 14-inch and 30-inch Comparator. This compact unit is a universal device to take various standard makes of mercury arc lamps.

For detailed information and specifications, or a demonstration, get in touch with your local Jones & Lamson representative, or write direct to Jones & Lamson Machine Company, Springfield, Vermont.

Jones & Lamson, the originator of optical comparators, proudly announces the J & L Mercury Arc Lamp, a remarkable development that tremendously improves and enhances the efficiency and precision of J & L 14-inch and 30-inch screen Comparators, old or new.

Interchanges with regular lamphouse in minutes.



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CIRCLE INFORM-A-GRAM KEY NO. 53

BASIC REQUIREMENTS FOR GENERAL PURPOSE GUN DRILLING

by Emery Dunning
Vice President & General Manager
EDLUND MACHINERY COMPANY
Division of Harsco Corporation
Cortland, New York

Why the sudden interest in Gun Drilling? What are the nine basic requirements? What results can be expected? What kind of operations should be considered?

GUN DRILLING IS AN OLD PROCESS that was first used for drilling gun barrels (from which it derived its name) and other deep troublesome holes. Primarily it was an initial means of "getting daylight" through a piece of steel so that the hole could then be enlarged to specified diameter and finish. The cutting tool was a piece of high carbon steel or, later, high speed steel mounted on the end of a long tube. Also, it was thought necessary to rotate the work in order to keep the holes reasonably straight.

This limited the speeds that could be used, because of the limitation of the cutting tool itself and because of the problem of any unbalance in the workpiece which would limit its rotation speed. Figure 1 shows workpieces presenting a problem of balance.

The feeds were necessarily limited because of the long tube that carried the cutting tool. The net result was that the feeds in ipm were very low, the process was costly and impractical and was only used in those problem cases where there was no other practical means of producing a hole.

New Cutting Tools

The development of carbide cutting tools at first did little to change the gun drilling picture as the restriction of rotational speed still existed because of workpiece unbalance. In other words, it would be impractical to rotate such unsymmetrical parts as shown in Figure 1 at 7600 rpm or higher.

Soon, however, research was undertaken in regard to the cutting tool with the following significant findings: If the axial alignment between the spindle and bushing was sufficiently accurate and the cutting tools were made with sufficient accuracy, and if the machine were also accurate enough, it was possible to drill to great depths with extreme accuracy while the work was held *stationary* and the *drill rotated.*

This opened up an entirely new field for gun drilling as the high speeds possible with carbide cutting tools permitted increases in the feed rate to the point where gun drilling could compete favorably with regular drilling. The shape or size of the parts to be drilled became no problem. Accordingly, greatly increased interest was taken in gun drilling.

New Cutting Oils

It soon became apparent that cutting oils used in gun drilling were not correct as they did not maintain viscosity and were too heavy to use with many of the small tools. However, there were developed several oils which have proved satisfactory.

New Gun Drilling Machines

It also became apparent that in many cases the machines were the restricting factor as spindle speeds were too low to take advantage of

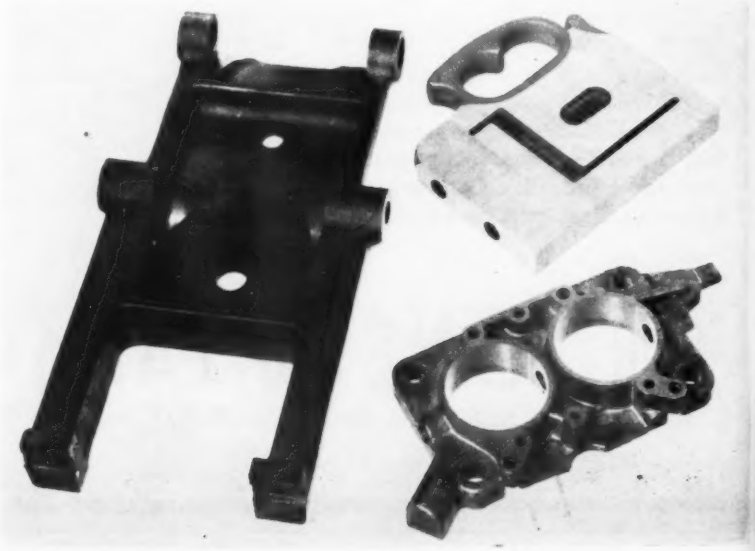


Fig. 1. When gun drilling is attempted by rotating both the workpiece and the drill, irregular and unsymmetrical workpieces such as these are apt to fly out the nearest window. These can be gun drilled on a vertical machine, with work stationary and drill rotated.

CUT YOUR COSTS WITH

Cleveland Gun Drills

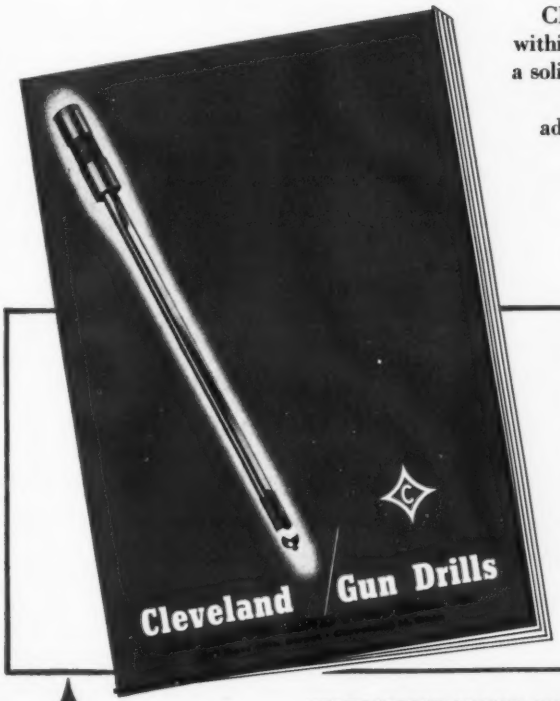
. . . on critical drilling jobs that involve fine finish . . . accurate size . . . pinpoint location . . . holes of all depths

Gun drilling has become an essential new machining technique for hundreds of firms. Jobs which otherwise would be done with great difficulty, or not done at all, are now handled on a fast-run production basis.

CLEVELAND Gun Drills have been responsible for important dollar savings by eliminating such operations as boring . . . honing . . . lapping . . . reaming . . . deep hole drilling which necessitates "peck feeding" . . . sequence of drilling, core drilling and reaming.

CLEVELAND Gun Drills can hold diameter tolerances within a few ten-thousandths of an inch—in one pass from a solid workpiece. Hole straightness of .002 inch maximum drift per foot is possible with a good set-up. In addition to eliminating secondary hole-sizing operations on many jobs, locating difficulties can be minimized.

Complete information will be found in the new book shown below.



NEW! Ask for your copy of this 16-page Gun Drill Manual

Illustrated with many photographs and drawings. Clearly explains the various types of shanks and heads . . . describes the machines that can be used for gun drilling . . . gives tables of feeds and speeds . . . tells how to use starting bushings . . . states the requirements for a coolant system . . . gives full information on point styles and resharpening. A helpful Data Sheet is included for your convenience in ordering. *Send for your free copy.*

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GREENLEE TRANSFER MACHINES

Change with Your Requirements

THIS MACHINE HAS BEEN REWORKED FOUR TIMES

The "building block" idea of machine tool design has gained much popularity in recent years. Greenlee has long built such flexibility into their transfer machines. For example, the machine shown here has been modified 4 times in 11 years to accommodate changes in product design. Protect yourself from costly obsolescence. Ask Greenlee to show you how.

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TO HELP SOLVE YOUR PRODUCTION PROBLEMS

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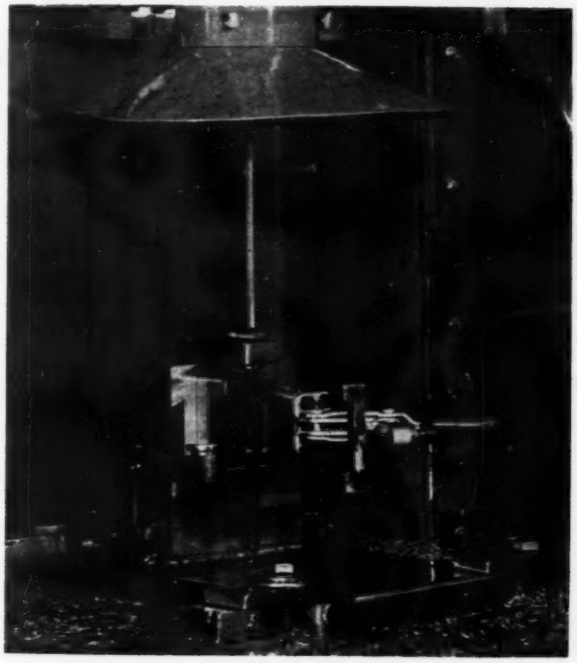


Fig. 2. A typical setup for gun drilling in a vertical machine: A deep hole of extreme diameter to length ratio. The fixture is fast loading and unloading. One operator can attend several spindles.

carbides, spindle construction was not accurate enough, particularly with respect to end play, and feed rates were either too coarse or not sufficiently constant for optimum performance.

A means of coordinating the necessary oil supply with the machine is necessary as we have found that the various elements necessary to satisfactory results are of equal importance and should constitute one package.

Requirements for Good Gun Drilling

Over the past several years the Edlund Machinery Company conducted extensive research in this field and the findings indicate that the following nine basic requirements are necessary for good gun drilling:

1. *A carbide cutting tool* able to withstand extreme speeds in order to reduce cutting time; the tool must accurately produce holes sufficiently straight and to size for the job requirements; and it must be capable of being sharpened with minimum of skill on the part of the tool grinder.

2. *A drill bushing* that can be held rigidly and accurately in position with clearances closer than used for conventional drilling. It is generally considered essential to relieve the upper portion of the bushing so that the bearing length is equal to about 1½ x the diameter of the cutting tool. In many jobs it has been found economical to use carbide bushings as their life is usually several times that of steel bushings. The bushing should be from 0.0001″ to 0.0002″ larger than the nominal drill size when new and should be discarded when it wears 0.0005″ over.

3. *A fixture* that may be simple but must be rigid and accurate. Axial alignment between cutting tool and the bushing must be very accurate. It is recommended that the bushing be indicated from the spindle and the alignment held within a 0.0004″ total indicator reading. Figure 2 shows a typical fixture and setup for gun drilling.

4. *A gland* is needed for introducing oil to the drill that will stand high speeds and high pressures with a minimum or complete absence of leakage.

5. *A machine* is needed which is sufficiently rigid to absorb the loads imposed on it and also will operate free of vibration at the high speeds required.

6. *A drill spindle* designed for operating at high speeds with an absolute minimum of end play. We are dealing with very fine feeds per revolution and do not want the drill to "hog-in" from spindle end play. This might result in a very heavy cut during one revolution and no cut for several revolutions.

7. *A feeding mechanism* which is constant is essential. The reason becomes apparent when we realize that we are using feeds as low as 0.0002″ per revolution. One of the reasons for using the fine feed is that the shank of the drill is relatively long and will not stand excessive thrust and torque. It is obvious then that we do not want to feed 0.0001″ one revolution and 0.0003″ the next with an average of 0.0002″. This would result in a variation of as much as 200%. Nor as the feeds go up do we want to drill 0.0005″ one revolution and 0.0007″ the next for an average of 0.0006″. This tends to put undue strain on the cutting tool but perhaps more important it tends to produce finishes that are not nearly as good as those produced by a constant feed.

8. *Quick adjustment of both spindle speed and rate of feed* is very desirable for general purpose gun drilling. Edlund's experience has indicated that in many cases a change of either speed or feed in an amount as little as 5% will make the difference between excellent results and fair results.

9. *Coolant oil from a large clean supply* at high pressure is needed at the cutting tool. It is recommended that the oil should always be filtered to at least ten microns. Means should be provided for maintaining a constant oil temperature. Oil pressure of 500 to 1000 lbs. is an absolute must. The higher pressures should be used with the smaller diameter tools if satisfaction is to be obtained.

These are the basic requirements. In addition, Edlund has found desirable certain safety features. Means should be provided so that the operator cannot inadvertently start the feed unless the high pressure oil unit is ready to deliver oil to the drill. It is also important that the feed be automatically disengaged in case the oil flow is interrupted either through a power failure or for other reasons. There is no surer way to break a drill than to let it run dry. It is important to provide a warning to the operator when the oil level becomes low.

Considering these basic requirements, it is evident why some companies have been disappointed with their efforts at gun drilling. In many installations most of the basic requirements were fulfilled but a small tank with a strainer on the intake to the high pressure pump was the only means of filtering the oil. This resulted in dirty oil being run through the pump which reduced the life of this very expensive item. The oil was then pumped through a rotating gland, whose life was shortened by the dirt. In some cases the oil hole through the drill has been plugged by dirt from the coolant system. This would result in oil starvation at the point of the drill and inevitable breakage.

If none of these things happened, the dirt was pumped back through the drill and tended to scratch the hole with the result that the finish was not good. In other cases we have seen installations where the coolant system was adequate but poor alignment between the drill spindle and the bushing resulted in out-of-size holes.

In still others we have found machines used that had passed their prime, and certainly were not suitable because of inadequate spindle speed, excessive end play, or unsuitable feeding mechanisms.

Neglect of any of the basic requirements can cause unsatisfactory results. Most of the requirements are relatively simple and need not be excessively expensive to attain, but each one is essential for good gun drilling.

The equipment to be used presents the question of whether the machine should be vertical or horizontal. Most machines now in use are horizontal, seemingly a holdover from working on long gun barrels with long drills. Vertical machines require less floor space. An operator can run two or more spindles with a minimum of footwork. Many parts can be loaded to advantage on a vertical machine.

The advantages of the horizontal machine are that two or more horizontal units can be mounted on one base to drill two or more holes at a time. Extremely long parts can be handled more efficiently in a horizontal position.

Results and Advantages

If the basic requirements are met, the following results and advantages can be expected:

a. Finish: Generally as good, and in most cases better than reamer finish. (2 to 32 micro-inches, depending on material).

b. Size tolerances: Usually from 0.0004″ to 0.0008″ depending on size and material.

c. Straightness: 0.001″ in six inches in most cases.

d. Depth: Any depth without withdrawing tool. Extremely important in case of work-hardening materials.

Fig. 3. A display of typical parts which are logical candidates for the gun drilling process.

e. Many man-hours can be saved by elimination of reaming, boring, honing, internal grinding, jig boring, jig grinding, and other secondary operations.

f. Savings in handling. One operation often takes the place of two or three operations, eliminating costly rehandling.

g. Equipment saving. A single gun drilling operation often replaces an expensive indexing machine for drilling and reaming a part, or jig boring or jig grinding equipment.

h. Skilled labor saving. Speeds, feeds, oil pressure and other necessary data can be determined by the planning department. Semi-skilled labor can operate the machine; this will release skilled labor for other work.

i. Greater freedom of product design. Part can be designed to take advantage of closer tolerances and better finish as low cost.

What Operations Should be Considered?

The following are the types of operations which should be considered for gun drilling:

Any production parts which require reaming, boring, honing, internal grinding after hardening or similar secondary operations because of size, finish or alignment specifications even though the hole is no longer than its diameter.

Any production part involving alignment tolerances that are difficult to hold by standard drilling even though size and finish are not important.

Holes that are of a depth that require interrupting the cut because of depth even though finish, size and straightness are not important.

Figure 3 shows typical parts that are adaptable to gun drilling.

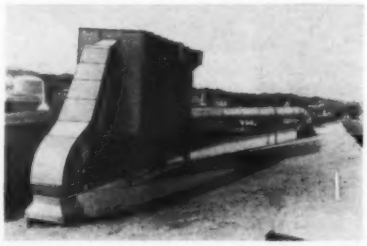
It ought not be concluded that all operations coming under these three categories should be gun drilled, but all should be scrutinized to determine whether gun drilling is practical and economical. Obviously, those operations which cannot be performed economically should not be undertaken. This process is not a cure-all and there are many limitations, at least in the present state of the art. Consultation with manufacturers of cutting tools or gun drilling equipment will usually reveal whether your operations are practical.

end

NEW FILTER CLEANS LARGE AIR VOLUMES

Cleaner air, better working conditions, reduced machinery maintenance costs, and complete salvage of valuable dusts are made possible with the new Dustkop Filterkop manufactured by Aget Mfg. Co. of Adrian, Mich.

Used with standard vented Dustkops, the Filterkop receives all air, recovers nearly 100% of the dust load, dissipates harmful fumes, and recirculates cleaned air. The basic



Filterkop unit consists of a heavy gauge steel housing, a hopper, 800 cloth filter tubes, and a shaker mechanism. Accumulated dust is automatically shaken from the tubes into the hopper at the end of each fan operation.

Single or multiple units can be used to fit individual requirements. One shaker serves two units and only one air inlet and one air outlet are needed for any size installation.

THIS PIN ENDS DIE SET SMASH-UPS IN CASE OF PIN SEIZURE

SUPERIOR'S *Exclusive* REMOVABLE CAP PINS

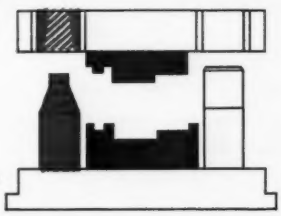
Now costly die set smash-ups can be avoided with Superior's removable cap pins.

In the event that foreign matter causes pin and bushing seizure . . . the socket screw pulls out of the retaining washer, then the matching taper of pin and cap act as a guide, preventing costly die damage as the punch holder is lowered by the press.

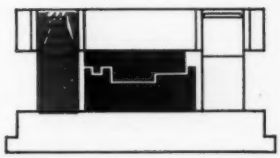
A new cap is merely substituted and the die set is ready for production. (Precision manufactured of removable cap pins permits interchangeability of caps.)

In addition, Removable Cap Guide Pins eliminate punch holder binding on guide posts when parting dies. The cap is removed from the pin merely by loosening a socket head screw which holds the cap in place. This frees the punch holder at the most critical point of the pin where it is apt to cock or bind.

Matching Taper and Cap act as guides prevent costly die damage



Note how cap tears loose in event of pin seizure other pin remains intact.



As punch holder is lowered in press, cap and pin act as guide. Replacing pin with a new cap puts die back into operation in minutes.

NOW on every Superior Die Set in diameters from 1½" upward at no additional cost.

Write for your free 28 page catalog on Superior die sets and supplies.

Case histories where die set smashups were avoided with removable cap pins furnished upon request.

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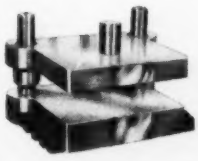

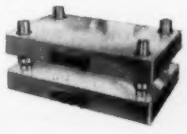

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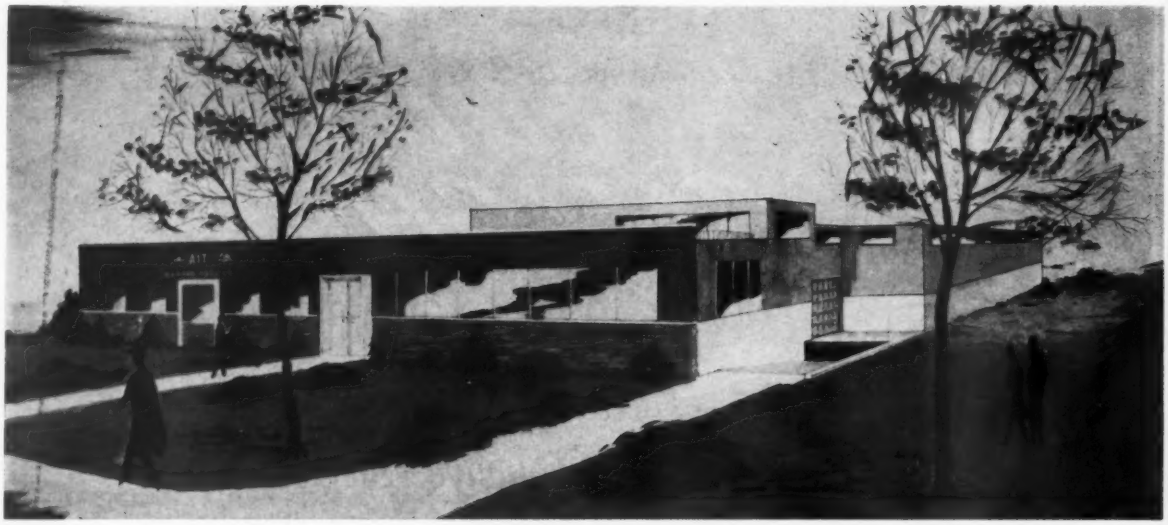


A.I.T.'s DIAMOND WHEEL-CARBIDE GRINDING CLINIC

visited by
E. Willard Pennington
Editor

AS A UNIQUE TECHNICAL AND TRAINING SERVICE to Industry, the A.I.T. Diamond Tool Company conducts a diamond wheel-carbide grinding clinic to which you have a standing invitation to bring examples of your carbide grinding projects. This will enable you to get, first hand, instruction and experience in both "Electrolytic" and "Electro-assist" carbide grinding with diamond wheels.

To get ahead of the story of our visit, this innovation has proved so important in the rendering of customer service, that A.I.T. is building a new plant adjoining their present facility at 8221 North Kimball Avenue, Skokie, Illinois.

Scheduled for completion this summer, their Plant #2, as depicted above, is of spacious ultra-modern design and construction with a "weather controlled" interior. It will house the research and development divisions, additional production facilities, new executive offices, and a large demonstration and schooling section which will be known as the "Dia-Mo-Rama Room."

This room will feature various types of grinders for all applications of diamond wheels to industry's grinding and finishing problems. Both conventional and electrically assisted machines will be in readiness for visitors who desire knowledge and information on new applications. The schooling and demonstration programs are designed to introduce new methods to the metal cutting, ceramic, stone, optical and glass industries.

A.I.T.'s research and manufacturing efforts are entirely in the field of industrial diamond use—wherever a diamond can be utilized for stock removal. They are constantly researching new developments and methods to encourage the use of diamond wheels and tools on, for instance, the new high temperature resistant materials.

When we served our two-hour apprenticeship at A.I.T.'s demonstration facility, we engaged in off-hand grinding of carbide tools on electrically-aided grinding equipment. We also experienced the setting of the power pack controls for the different amounts of stock to be removed, and checked our "skill" with a stop watch. Using power feed, we were able to remove 0.010″ carbide from a 1/2″ x 1/2″ tool area in seven seconds. This was consistently repeatable for ten or twelve times.

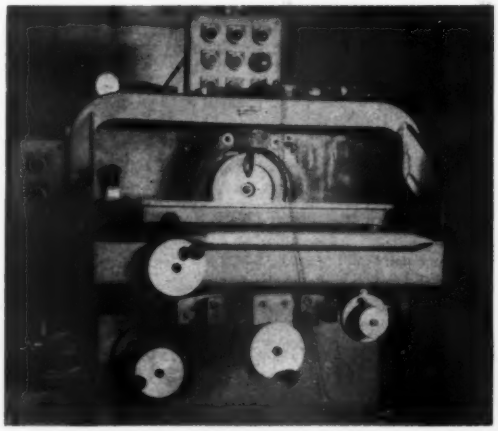


Figure 1. The A.I.T. demonstration center is more than adequately equipped with grinders, electric power sources, controls, coolant provisions, and diamond wheels—all ready to go at the push of a button. On top of the grinder are sample tools which were at our disposal for instructions in electrically-aided carbide grinding.

FINALLY...

A DIAL INDICATOR WHOSE MOVEMENT MECHANISM IS SO WEAR-RESISTANT ... SO SHOCK-RESISTANT ... THAT YOU WILL PROBABLY NEVER HAVE TO REPAIR OR REPLACE IT!

We say "probably" because it's likely that some MIRACLE MOVEMENT Indicators will meet up with such out-and-out abuse that their operation may ultimately be impaired. But, given the same hard shop usage as any other Dial Indicator, a MIRACLE MOVEMENT Indicator will outlast it many times over.

The MIRACLE MOVEMENT Indicator is not only wear-safe . . . it's also shock-safe. Contrary to what you might expect, no supplemental, "extra-price" devices need be added to the movement to obtain this protection. The MIRACLE MOVEMENT *itself* is shock-safe. So you get this protection automatically. You do not have to specify it . . . you do not pay extra to get it. Every MIRACLE MOVEMENT Indicator has it.

Nor do you have to specify MIRACLE MOVEMENT in order to get the finest Indicator of them all. From now on, *all* Federal Dial Indicators, except Super-Sensitive and Special Movement Models, will have the MIRACLE MOVEMENT. So, to have all these important features . . . all you have to do is specify Federal.

And, as you might expect, your present Federal Dial Indicator can be converted easily because the MIRACLE MOVEMENT is also available separately as a replacement unit, either Full-Jeweled or Plain Bearing. It fits into a current Model Indicator case without any changes.

You owe it to better, longer lasting accuracy and to drastically reduced Indicator maintenance costs to standardize on Federal MIRACLE MOVEMENT Indicators

. . . certainly the finest of them all.

FEDERAL PRODUCTS CORPORATION
9237 EDDY ST., PROVIDENCE 1, R. I.

Ask **FEDERAL** *First*

FOR RECOMMENDATIONS IN MODERN GAGES . . .

for recommendations in modern gages . . . Dial Indicating • Air • Electric or Electronic — For Inspecting, Measuring, Sorting, or Automation Gaging.

CIRCLE INFORM-A-GRAM KEY NO. 61

Fig. 2. We tackled off-hand grinding of small radii. It was noticeable that the usual heat and need for external pressure related to most carbide grinding were eliminated with the electrically-aided method.

We also had the opportunity to grind single point tools, of various carbide grades, and with large and small surfaces. We found it unnecessary to change the voltage setting on the Econo-Grind power pack—the meter remaining at 5 volts. You will note, as we did, that if the surfaces being ground are large, the amperage draw is greater, and vice versa. We were able to grind tools with carbide areas of 1" x 1" without using the full 150 ampere capacity of the power unit.

This work was done with diamond wheels which A.I.T. has developed for the process.

Should you visit A.I.T.'s clinic you will find that for the Econo-Grind power pack, A.I.T. has a diamond wheel designated as EA-2. This wheel is engineered for use with the Electro-Assist method, whereas their E-2 wheel designation applies to wheels destined for use with the Electrolytic method. You will be briefed on the procedures for getting the E-2 diamond wheels into a high rate of production without the usual wheel break-in time. Thus you can witness the advantages of using diamond wheels that are serviced for each type of electrical power unit.

You will find, see demonstrated, and be welcome to try out yourself, other diamond wheels manufactured by A.I.T. These include their Resin and Al-Aloid bond diamond wheels for conventional applications. Their Al-Aloid bond is recognized as a most highly acceptable bond for plunge grinding and regular grinding where metal bond wheels are used employing flowing coolants. Also new is a resin bond diamond wheel, in all types for longer life when used wet and dry. They have recently developed a new type resin flaring cup wheel which in many cases offers a much longer life thereby reducing the grinding cost per tooth when multi-tooth cutters are being ground.

Of interest to most A.I.T. visitors is the fact that their present machines and carbide grinding procedures do not have to be replaced. Grinders now in use merely need the addition of coolant facilities (if they are not already present), spindle insulation, the electric power unit, and appropriate choice of wheel.

Today, machine tool builders are offering newly developed grinding machines incorporating all the features essential for use with electrolytic units.

The demonstrations you can see and participate in at A.I.T. should give you complete answers to any questions on your carbide grinding operations with electrically-aided diamond wheels. end

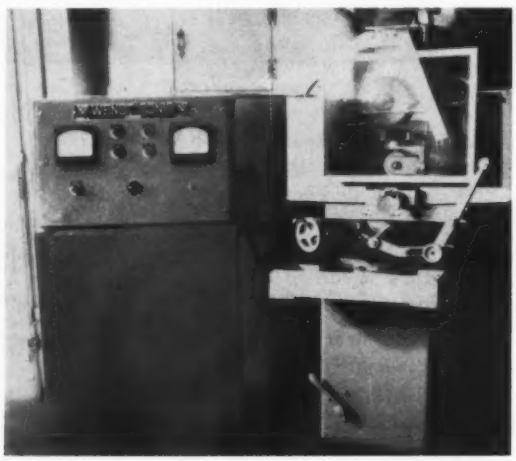


Fig. 3. This setup for chip breaker grinding can also be used for a variety of surface grinding applications. To convert a standard grinder for wet grinding with an electrical control unit merely takes the addition of coolant supply, splash guards and insulated spindle.

SPELLMACO SPOTTERS

A matched set of transfer punches for toolmakers, machinists and tool cribs.

Used for transferring location of threaded, drilled and reamed holes, slugs, blanks, etc.

Precision made of finest tool steel carefully heat treated and tempered for long life. .0025 undersize to facilitate use—black oxide finish.

Set No. 3-17: 28 punches with indexed stand — sizes 3/32" to ½" by 1/64" plus hand 17/32" size—length 4⅞". PRICE only $17.90

Single size available.

R. L. SPELLMAN CO. • Urbana, Ohio

CIRCLE INFORM-A-GRAM KEY NO. 621

LEAD HAMMERS—Buy Cook "SHUR-GRIP"

They're a MUST in every shop where many blows have to be struck without marring surfaces. Available with "SHUR-GRIP" drop forged handles.

Write for circular and prices

COOK'S LEAD HAMMER SERVICE

68 Massasoit Ave., E. Providence 14, R. I.

CIRCLE INFORM-A-GRAM KEY NO. 622

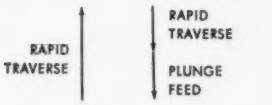
The Inform-A-Gram card which follows page 82 is for your convience in making inquiries about advertised Products and Editorial items.

How to increase productivity with...

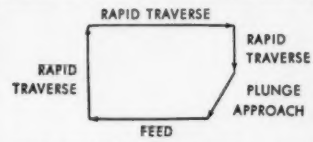
Multicycle Hobbing

Any one of these automatic cycles can be selected simply by turning a switch on the control panel.

SQUARE CYCLE – automatic version of the conventional hobbing cycle.



PLUNGE CYCLE – automatic vertical feed for cutting worm gears.



PLUNGE-APPROACH CYCLE – combination of "plunge" and "square."

Automatic cycling plus the opportunity to greatly reduce approach time in many cases makes the Multicycle version of the Barber-Colman No. 16-16 Hobbing Machine a high-production machine, and yet it is extremely versatile.

Reduce approach time

The new Multicycle machine offers three different automatic cycles (see sketch). Any of these can be selected simply by turning a switch. With the plunge-approach cycle for cutting helical gears and worms (or when using large, multiple-thread hobs), you can greatly reduce long approach time. With the push of a button, cam vertical feed and conventional horizontal feed cycle automatically. The hob starts cutting at full depth faster. Clamping and unclamping of the workslide is automatic. The operator just loads and unloads the work.

Automatic machines can be versatile, too!

To cut worm gears, turn the selector switch to "plunge," disengage the feed change gears, turn the dial control to proper cam speed, set the vertical stops, and push the start button. The workslide lowers rapidly to the cutting position. The work feeds slowly to full depth as it is being hobbed, and then dwells for the desired number of revolutions. When the hob stops, the workslide returns to starting position.

Is there a Multicycle machine for you?

You bet there is. These same features are available in the No. 6-10 machine. Additional equipment, such as differential gearing, accessory vertical feed cams, and even full automation, will adapt this precision hobbing machine to almost any job. Send us prints of your gears. We'll give you a complete report on the time saved by a Multicycle machine. Call your nearest Barber-Colman field office or the factory, WO 8-6833.

Barber-Colman Company

BARBER COLMAN

77 Loomis Street • Rockford, Illinois

CIRCLE INFORM-A-GRAM KEY NO. 63

GUARANTEED FOR 18 MONTHS

AND WE MEAN UNCONDITIONALLY

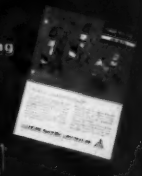
That's right. Clearing will guarantee the drive unit of Torc-Pac presses for 18 months. And, as you know, the drive is the heart of the press. The Torc-Pac clutch and brake never require adjustment. The sealed-in-oil drive is designed so that wear which is taken by the friction linings in a conventional air friction clutch, is actually absorbed in the oil.

You just don't have to touch the clutch and brake. In fact, the only thing that could void our guarantee is a condition where the drive has been tampered with by unauthorized personnel.

Torc-Pac presses are available now in capacities of 22, 32, 45 and 60 tons—in high speed ranges, too. Get in touch with Clearing for the full story.

Clearing division of U. S. Industries, Inc. manufactures power presses of all types, Clearing-Axelson and Clearing-Harrison lathes, dies and special tooling, and special equipment for the aircraft and missile industry.

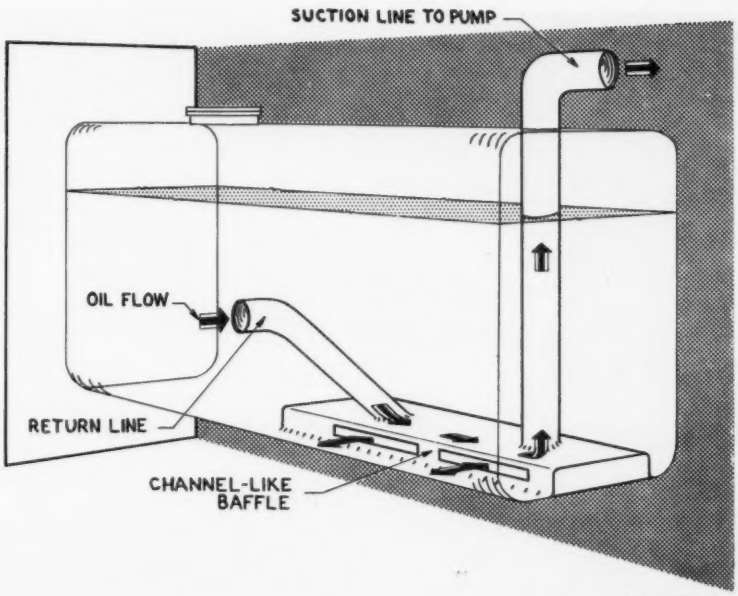
Write for further engineering facts on Clearing's line of Torc-Pac O.B.I.'s.



USI Clearing

DIVISION OF U.S. INDUSTRIES, INC.

6499 W. 65th Street, Chicago 38, Illinois



Patent Pending

PRODUCTION OFF?

BUBBLES IN HYDRAULIC LINES MAY BE THE PROBLEM... BAFFLES, THE ANSWER

THE PRESENCE OF EXCESSIVE AMOUNTS OF AIR in a hydraulic system can lower operating speeds of powered components. This condition also causes erratic halting action in machine movements. If sufficient air is present, cavitation will cause premature pump failure.

Tight suction lines are, of course, necessary to prevent entrained air in a fluid power system. But trapped air is often caused by foaming, which in turn is caused by a swirling action in the reservoir — either from the return stream, or movement in the suction area, or both.

Anti-foam agents can be added to the fluid medium, and you can tighten your lines, but the greatest rewards are to be had by stopping the swirling in your reservoir. Design of this component may be what's giving you trouble.

"Trouble" might mean that a good workpiece finish was not obtained. Or, it may show up as a lack of respect for tolerance, poor tool life, or high maintenance tabs.

There are many ways to approach the problem; all intending to either stop foaming or hinder the bubbling oil from reaching the suction basin. An oversized tank may be the answer, if space allows. Perhaps repositioning the return and suction lines will do the trick. Or, a discreet use of baffles may do it.

If baffles are used, it is necessary to make sure that the tortuous path of the oil, from intake to suction, is adequate at all points to supply suction demand at all times. Care should be taken that the path is not too difficult — or the remedy may become a cause.

One of the best reservoir designs we have seen is being used by the Yale & Towne Manufacturing Company. Forced by space conservation demands to keep their tank size to a minimum, they have found that proper positioning of the "in" and "out" lines, plus a baffle, is their best approach.

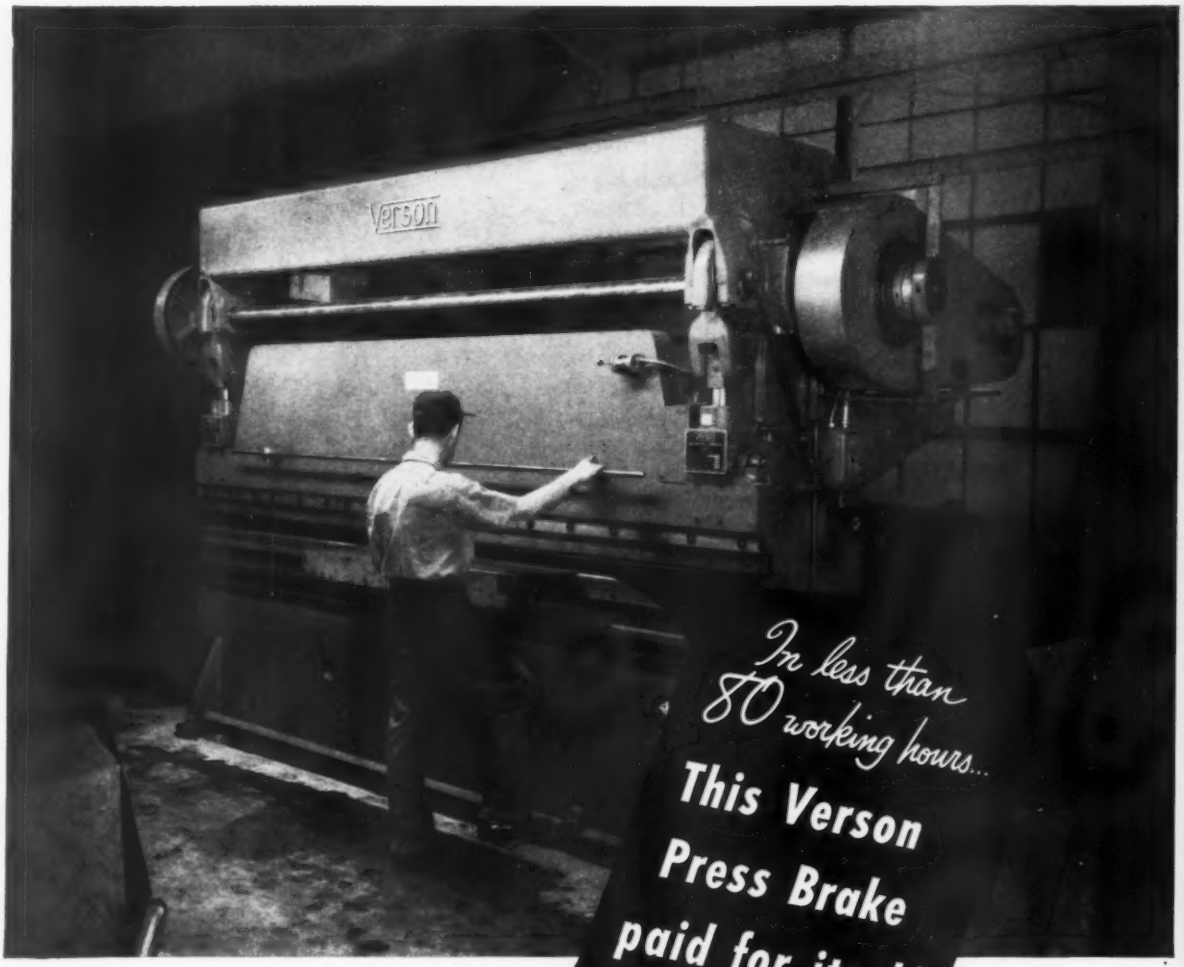
They tell us their first effort at baffling was to place a plate, having a number of holes, across the middle of the tank, thus separating the return line inlet area from the suction line outlet area. Theoretically this would confine surging to the inlet side of the tank and offer a calm reservoir of oil for outlet. It was found that at higher speeds "bleeding" through the baffle was too slow and the pump was occasionally "starved." When rapid traverse called for large volumes of oil the demand, although too slow to starve suction, created high velocities through baffle openings, which were conducive to swirling and foaming.

The final solution, sketched here, directs the return oil close to the bottom of the tank under a channel-like baffle. Through this channel the oil flows almost directly from return to suction. In effect, the oil in the channel is supercharged. When there is an excess of oil in the channel it bleeds out of side slots into the larger reservoir area. Then, when suction calls for more oil than that being supplied from return, this is made up by an inflow through the same slots.

A fringe benefit: The system operates through the coolest portion of the reservoir which offers lower temperatures and adds overall efficiency to a hydraulic system.

— W.E.H.

← CIRCLE INFORM-A-GRAM KEY NO. 64



Add Chicago Dryer Company, Chicago, Illinois, to the ever-growing list of satisfied Verson Press Brake owners. In the manufacture of "America's most complete line of commercial flatwork ironers", Chicago Dryer Company uses this Verson No. 2010 Intermediate Series Press Brake to form flatwork ironer end frames from 5′ lengths of 11 ga. mild steel. Two bends are made, utilizing the Verson Press Brake handled by two operators. In the past, this job required six men working with a hand brake.

Two trays are furnished with each of fifteen flatwork ironer models manufactured. Formed from 12′ lengths of 16 ga. mild steel, the trays were formerly fabricated by an outside source. Carrying an inventory ranging from 5 to 25 trays for each of fifteen ironer models was necessary. Using the Verson Press Brake, trays are now formed as needed, eliminating inventory and reducing the cost per piece.

Although this Verson Brake has been operated only 80 working hours since installation, Chicago Dryer Company reports the machine has already paid for itself in labor savings, convenience and increased production.

A Verson Press Brake may be the answer to your metal forming problems. It costs nothing to investigate. Call or write, today.

A Verson Press for every job from 60 tons up.

212

ORIGINATORS AND PIONEERS OF ALLSTEEL STAMPING PRESS CONSTRUCTION

VERSON ALLSTEEL PRESS CO.

9335 S. KENWOOD AVENUE, CHICAGO 19, ILLINOIS • 8300 S. CENTRAL EXPRESSWAY, DALLAS, TEXAS

MECHANICAL AND HYDRAULIC PRESSES AND PRESS BRAKES • TRANSMAT PRESSES • TOOLING • DIE CUSHIONS • VERSON-WHEELON HYDRAULIC PRESSES

CIRCLE INFORM-A-GRAM KEY NO. 66

The Eastern Machine Screw Corp. recently announced the election of **Charles W. Wesson** as president and **Carl W. Bettcher,** former president, as chairman of the board.

Size Control Co., a Division of American Gage and Machine Co., recently appointed **Frank J. Vlasaty** director of research engineering, to direct the activities of departments doing special gage and missile work.

Taking over as quality and standard engineer at DeWalt Division of American Machine & Foundry Co. is **Werner A. Rees.** He's responsible for all engineering standards and test engineering activities.

Election of **James A. Taylor** as president of Standard Screw Co. was announced recently by the company. Taylor, formerly vice president, succeeds **W. D. Corlett,** who advances to chairman of the board.

Greenfield Tap & Die Division of United-Greenfield Corp. recently named **Glen H. Stimson** chief engineer, succeeding **Oscar E. Koehler,** who has retired.

Vice president and general manager of Universal-Cyclops Steel Corp. is **Fred A. Kaufman,** and **Peter C. Rossin** is general manager of the Refractomet Division, Kaufman's former position.

Election of **Eric G. Messler** as vice president and assistant general manager of Sandvik Steel, Inc., has been made known.

The board of directors of The American Hardware Corp. recently elected **Robert E. Parrett** vice president. He also serves in the newly created post of director of manufacturing, to direct operations in all American Hardware plants in this country and Canada. **Joseph Edwin Madigan** has taken over as plant manager of Kwikset Locks Division.

New appointments in Pontiac Motor Division's engineering department include **John Z. De Lorean** and **J. P. Charles,** assistant chief engineers; and **Mark J. Garlick** takes over as executive engineer.

Paul Hanscome is general manager of the Jarvis Corp.'s subsidiary in Burlington, Mass., and is assisted by **Frederick Wold.**

As new manufacturing manager of the George L. Nankervis Co., **C. W. Trautman** is responsible for all manufacturing in the fabrication of Nankervis test equipment.

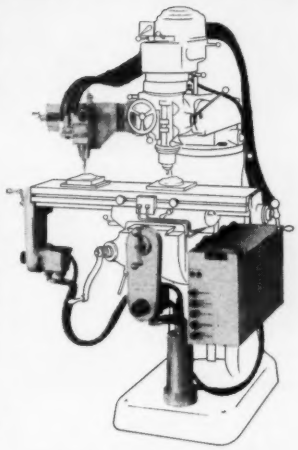
SYNCHRO-TRACE—FULLY AUTOMATIC 3D PROGRAMMED CONTROL SYSTEM CUTS COST OF DIES, MOLDS AND CONTOURED PARTS BY OVER 50%.

Now—Produce dies, molds and contoured parts faster, with greater accuracy using Synchro-Trace duplicating attachment with your milling machine. Synchro-Trace fully automatic operation allows operator, formerly required, to perform other important duties. Costly benching time reduced as much as 50% due to uniform feed rate, high tracer accuracy, and the even amount of "pick" with each pass of the cutter. Accurate estimates of machining time required may be made, as cutting path, feed, and amount of cut are pre-determined for every pass of the cutter.

Synchro-Trace will duplicate any shape of part—even 90° walls. Other features include "pick" feed in either direction, fixed stylus oversize, automatic shutdown, plus many others.

Synchro-Trace may be purchased as original equipment on new mills or adapted to existing tool room, production, and planer type milling machines.

Contact your nearest True-Trace dealer or direct factory branch plant TODAY for further information on how Synchro-Trace can cut your 3D contouring cost.



For complete data write for new illustrated brochure #STM-1 today.
Dept. TP

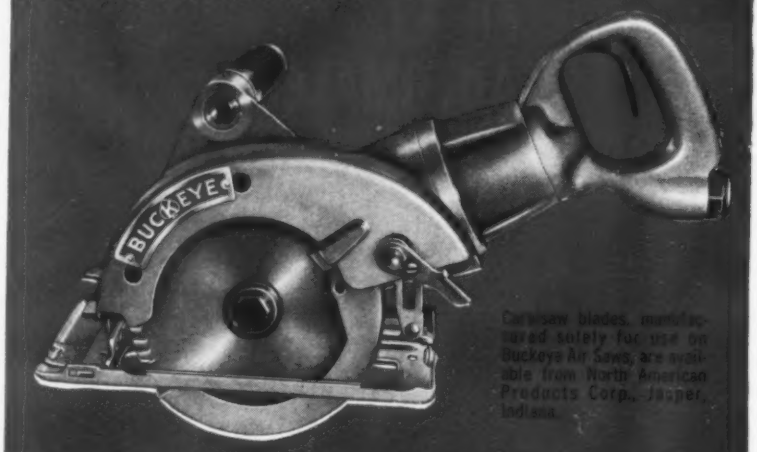
TRUE-TRACE
SALES CORPORATION

9830 Rush Street, El Monte, California
Branch Plants: 35 Urban Avenue, Westbury, Long Island, New York
2401 Eaton Lane, Racine, Wisconsin

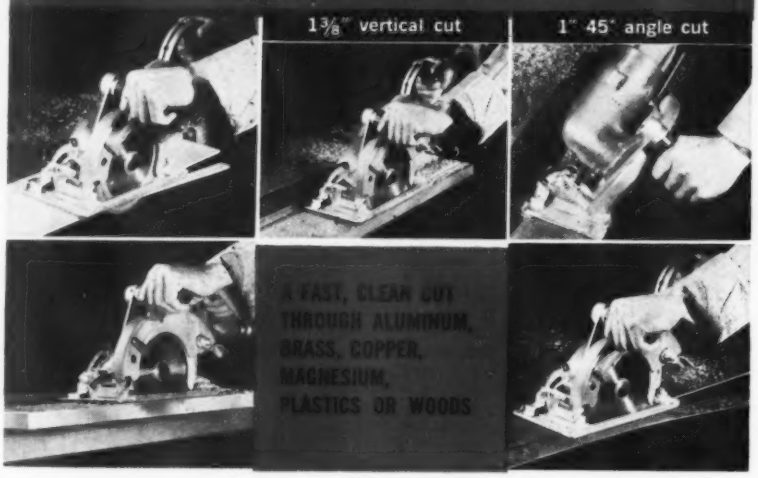
CIRCLE INFORM-A-GRAM KEY NO. 67

the most useful SAW you'll ever see!

BUILT TO U. S. NAVY REQUIREMENTS BY BUCKEYE



Carbasaw blades, manufactured solely for use on Buckeye Air Saws, are available from North American Products Corp., Jasper, Indiana.



Just squeeze the safety throttle and this portable saw starts cutting—right now! Powerful, governed Buckeye air motor is geared to produce the torque needed for a fast, sharp cut, even on non-ferrous materials. No backups to allow saw to regain speed, and no burnouts from overloads. Lightweight—16½ pounds—perfectly balanced for ease of handling. ⅝" arbor accommodates blades for fine, medium and heavy duty work.

WRITE FOR CATALOG

Write, on your company letterhead please, for your free copy of Catalog C-10, listing all Buckeye air tools—drilling, fastening, abrasive and sanding.

INDUSTRIAL AIR TOOLS SINCE 1920

Buckeye Tools CORPORATION

3673 SPRINGBORO PIKE, DAYTON, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 68

Calling Cards from page 67

Englehard Industries, Inc., announced that **Harold E. Gray** now serves as works manager of the Baker Contact Division; **Charles de Rohan,** production manager of the Hanovia Lamp Division; and **Julian J. Keenan** is plant manager at D. E. Makepeace Division.

Paul V. Brown was recently appointed manager of manufacturing of the La Verne, Calif., plant of Taylor Fibre Co.

New head of special products for Sahlin Engineering Co. is **Harry Tiffany,** who is responsible for development of special machinery for the mechanical handling of sheet metal in press rooms.

Sharon Steel Corp. has promoted **John R. Rinderknecht** to assistant director of profit control and computer programs. Before taking over this newly created position, Rinderknecht was controller for the Brainard Steel Division.

Lester M. Cole, general sales manager of The Warner & Swasey Co., was recently elected vice president in charge of sales. He directs the sales activities of the Machine Tool Division.

The appointments of **Donald R. Steward** as district sales manager and **Kenneth E. Melvin** as sales representative were recently announced by Simonds Worden White Co. Stewart is responsible for grinding wheel sales in Michigan and northern Ohio, with Melvin assisting.

New chief sales engineer for the Press Division of the E. W. Bliss Co. is **Jack L. Kennedy.** He takes over following the retirement of **Harold B. Morse.**

M. J. O'Halloran is the new assistand general sales manager, industrial product sales, for Kaiser Aluminum & Chemical Sales, Inc. He succeeds **S. P. Whiteside,** who becomes northeastern regional sales manager.

Taking over as district manager for the Detroit industrial sales office for Vickers Inc. is **Jacques Carpenter.** He was formerly district manager at Worcester, Mass.

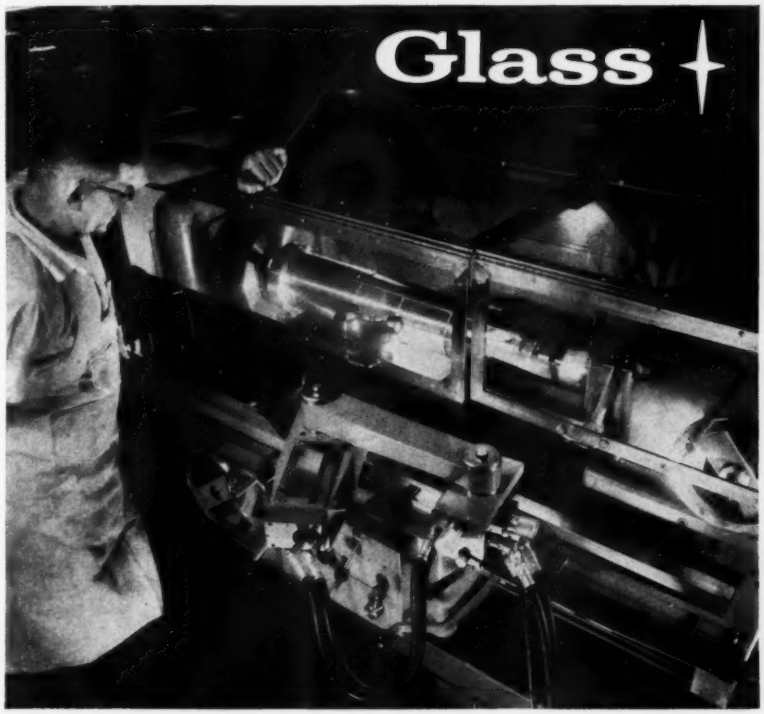
Richard Y. Neiley now serves as assistant industrial sales manager for Sperry Products, Inc.

Taking over as director of sales for Daco Instrument Co. is **Peter V. Cerar.**

Three sales representatives have been added to the sales force of Sharon Steel Corp.'s Brainard Strapping Division. **Wayne E. Bradley** serves in the Indianapolis area; **Dale H. Adams** in Baltimore; and **Richard A. Rechlicz,** Wisconsin and upper Michigan.

Barber-Colman's new 36-speed tracer lathe shows startling results on short-run work. Total costs slashed at speeds which give 30-minute tool life.

Tracing Under Glass



Here is evidence that general-purpose lathes designed for carbide-ceramic speeds are one of the most profitable investments you can make.

The reason lies in the expendability of carbide inserts. Economical machine speeds with throwaways are far beyond those recommended in machinability tables. Speeds between 600 and 900 sfm, calculated to yield 30-minute tool life, reduce *total* cost per piece by as much as 80%.

An example is this 4140 steel forging — 32 in. long by 8 in. max. dia. It is step turned in 6 min. cutting time on a Barber-Colman 36-speed lathe. A hot stream of chips makes it necessary to shield the entire work area, a requirement for which the front-mounted tracer offers definite advantages. Thirteen different diameters are turned and two ends faced at 600 sfm, with .020-ipr feed and 1/4 in. depth of cut. Turning is done by a 1/2-in. triangular carbide insert. Floor-to-floor time is 19 minutes against the former time of 2.1 hours.

The objective in setting feeds and speeds was 30-min. tool life (per edge). But, even at 600 sfm, longer life is experienced due to the machine's unusual rigidity.

More examples . . .

Other jobs being turned at ultra-high speeds include long lead screws — 750 sfm at 1/16 in. depth of cut and .018 ipr feed. The machine turns out three times as much work as two lathes formerly used. In another step-turning operation, tests already prove a 52% gain over the previous time with tracer, and the maximum processed rate has not yet been established. These are savings on jobs averaging 6 to 50 pieces.

Versatile tooling . . .

This hydraulic tracer offers two advantages for increasing utilization of a lathe. *First*, it will duplicate consistently within .001 in. on diameter or length, and it will operate at 90° to the work axis.

Second, the attachment can be removed and replaced by the regular compound in just 20 minutes. This versatility permits economical use of the machine for turning, boring, roughing and finishing, tracing, and both internal and external threading.

Quality features . . .

The lathe itself gives you a new combination of design features that improve performance at high speeds:

(1) Unusual rigidity is provided by the 30 in. span of the front carriage way, scientific bed webbing, 400-lb tailstock, and precision-ground spindle supported at both ends and in the middle by three sets of tapered roller bearings.

(2) Headstock is a dense, Meehanite casting which responds best to vibrations encountered at high speeds.

(3) All headstock gears are hardened and ground.

(4) Automatic pickup on the carriage simplifies positioning of the two-speed tailstock through carriage feed or traverse.

Information . . .

Write today for our new 16-page catalog showing how this new Barber-Colman precision machine can pay for itself quickly as a replacement for an old lathe.

Barber-Colman Company

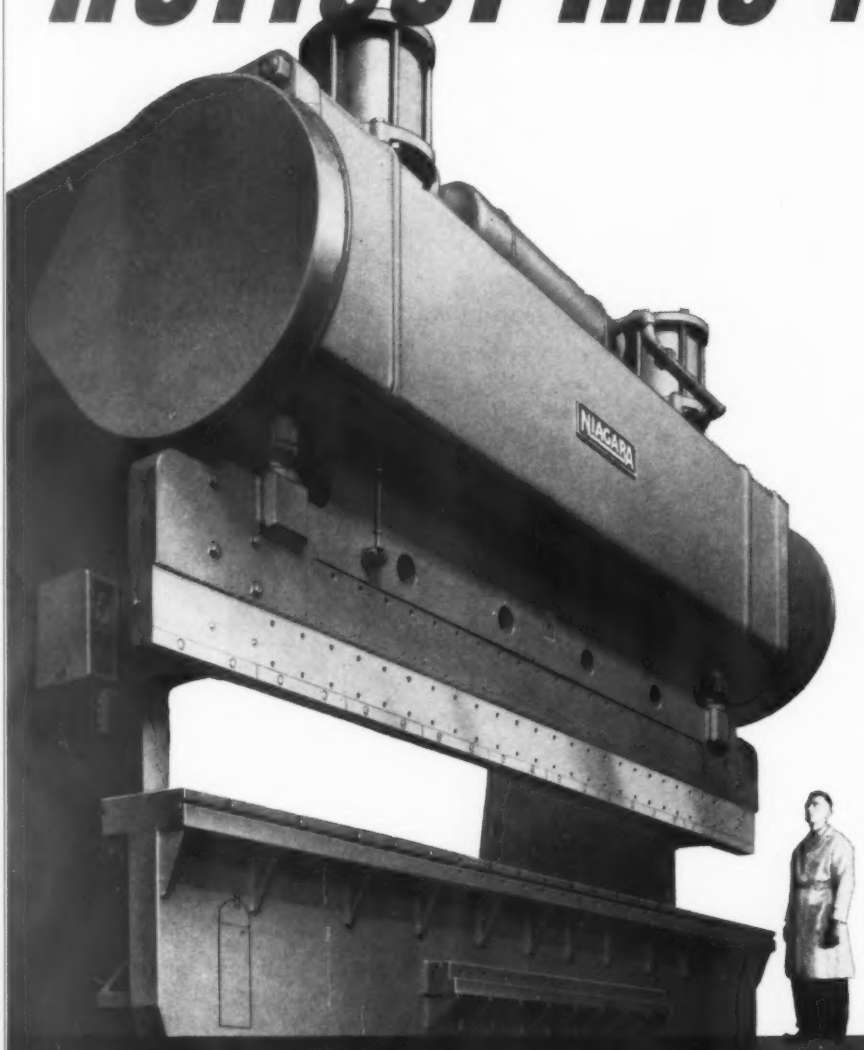
BARBER COLMAN

77 Loomis Street, Rockford, Illinois

CIRCLE INFORM-A-GRAM KEY NO. 69

NIAGARA PRESS BRAKES

hottest line in '59



..way out front in production-boosting, cost-cutting features... highest dollar value of all

Hottest line in the industry, more Niagara Press Brakes are being bought today than ever before.

What's behind it? **Performance!** Downright, measurable, press brake performance! High hourly output with minimum operator effort is setting new work standards in plant after plant.

How about you? Want to sail through your schedules at record-breaking speed... cut your operating and maintenance costs to the bone... hold your capital investment to a **practical minimum... then Niagara is the press brake for you.**

Talk it over with a Niagara sales engineer. He has the facts to give you a fair comparison ... **on every point.**

77 sizes to choose from

- 15-1500 tons
- Power or Manual Clutch
- Smooth, micro-inching ram
- Wear resistant, non-metallic ways
- Gearing enclosed in sealed oil bath

NIAGARA MACHINE & TOOL WORKS • BUFFALO 11, N. Y.

DISTRICT OFFICES: Boston • Buffalo • Cleveland • Detroit • Indianapolis • New York • Philadelphia
Distributors in principal U. S. cities and major foreign countries

MEN YOU SHOULD KNOW

Recently appointed vice president in charge of manufacturing at Pesco Products Division, Borg-Warner Corp., is **Tom G. Conway.**

The Nuclear Division of The Martin Co., has announced the recent appointment of **Dr. Clare P. Stanford** as chief of its engineering department. Head of the Missiles and Electronics Engineering is **Frederick R. Dent, Jr.,** and the Manned Vehicles Engineering Division is under the direction of **Herman Pusin,** former chief engineer of the Baltimore Division.

The election of **Howard Carson** as vice president of Cadillac Gage Co. and general manager of the Costa Mesa operation, has been announced by the company.

Recent appointments at Cincinnati Milling Machine Co., include **Alfred T. Blackburn,** vice president in charge of manufacturing, and **Clyde B. Eby,** works manager.

Square D Co. has announced that **Edmund V. Doeden** is the new works manager of the Electric Controller & Mfg. Division.

In his new position as manager of the Industrial and Machine Tool Operations for Radio Corporation of America, **Irving C. Maust** is responsible for the development and marketing of RCA automation equipment and systems.

Ormal Annable, general superintendent of production at Chevrolet's Cleveland transmission plant, is now serving as master mechanic at Buick. **James W. Sibley, Jr.,** has moved up from superintendent of the service parts plant to assistant general superintendent on special assignment.

Now serving as vice president of The Gabriel Co.'s wholly-owned subsidiary, The Talco Engineering Co., is **Richard J. Seltzer.**

Ralph S. Purcelli, executive assistant to the general manager of Rockwell Mfg. Co.'s Barberton, Ohio plant, has taken over as general manager of the company's Porterville, Calif., plant.

The Elwell-Parker Electric Co. has announced that **John A. Draxler** has been promoted to chief engineer. He was formerly assistant chief engineer.

The appointment of **John A. Buzby** as project engineer was recently announced by General Devices, Inc.

Taking over as chief metallurgist of Landis Machine Co., is **D. F. Griffin.**

NEW! BAUSCH & LOMB STEREOMICROSCOPES

give you

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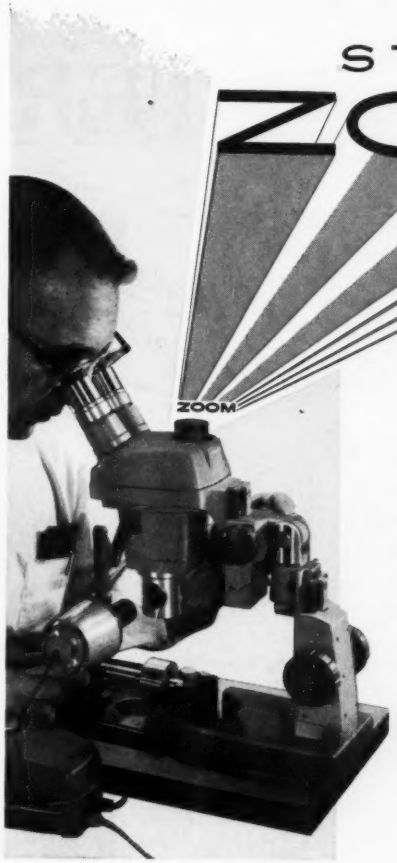

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. . . about one-third lower than previous line!

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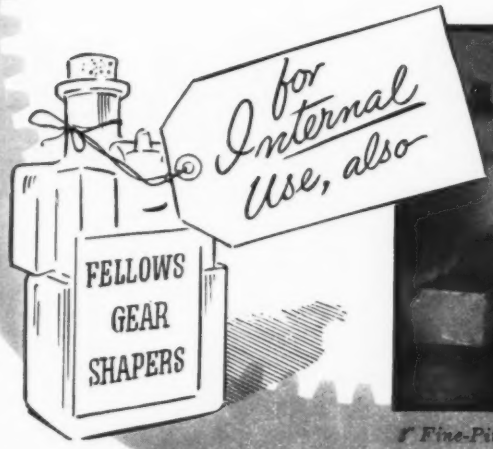
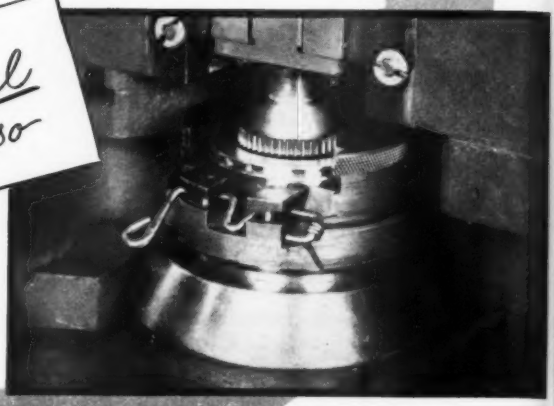
←CIRCLE INFORM-A-GRAM KEY NO. 70

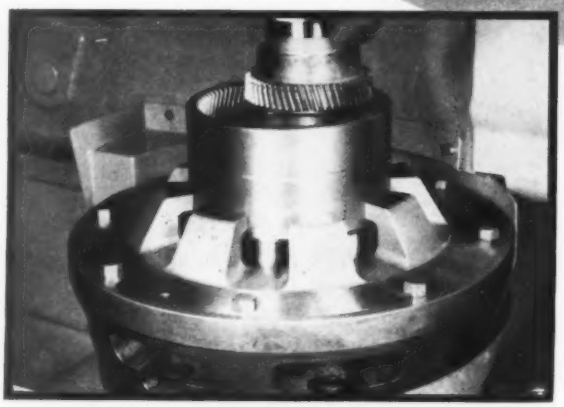
CIRCLE INFORM-A-GRAM KEY NO. 71

FELLOWS GEAR SHAPERS cut INTERNAL Gears

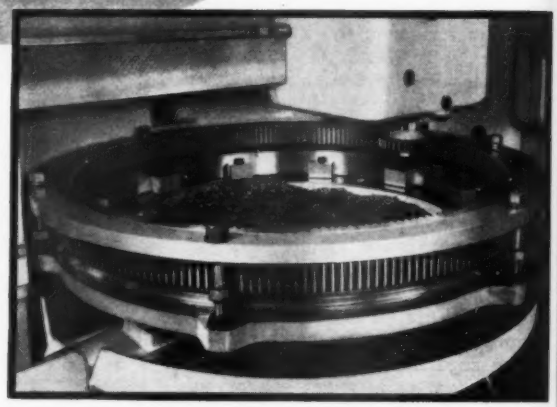




5' Fine-Pitch Gear Shaper cutting internal gear.



No. 10 Rotary Gear Shaper cutting internal helical.

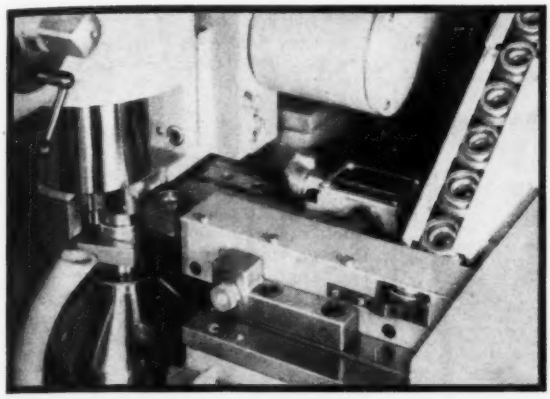


36-Type Gear Shaper with special work-holding fixture.

120" Gear Shaper cutting light tank turret gear.

THE PRECISION LINE

as EASILY as Externals



4GS Gear Shaper with full-automatic operation.

7A-Type Gear Shaper with fast-action diaphragm chuck.

Not only internal gears, but splines, clutches and an almost unlimited variety of other internal shapes can be produced on versatile Fellows Gear Shapers just as simply, rapidly and economically as external shapes. In many cases, the same Gear Shaper cutter can be used to cut both internal gears and their mating pinions.

Set-ups and change-overs are simple and fast on any Gear Shaper from the 3-Inch Fine-Pitch to the 120-Inch. Rigid construction makes it possible to hold close tolerances at high production rates. On some models, full or semi-automatic operation is available whenever the size and shape of the work and the production requirements make it practical.

Your Fellows Representative can give you full information about the production benefits of Fellows gear shapers, shaving machines, grinding machines, inspection instruments, or cutting tools. Just contact the nearest Fellows office.

THE FELLOWS GEAR SHAPER COMPANY
78 River Street, Springfield, Vermont
Branch Offices: 1048 North Woodward Ave., Royal Oak, Mich.
150 West Pleasant Ave., Maywood, N. J.
5835 West North Avenue, Chicago 39
6214 West Manchester Ave., Los Angeles 45

Fellows *Gear Production Equipment*

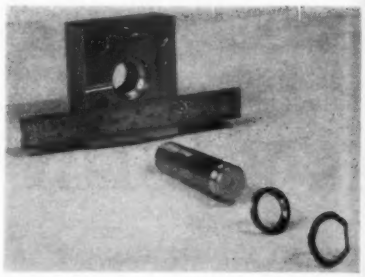
CIRCLE INFORM-A-GRAM KEY NO. 73

UNIQUE LOCKING METHOD SECRET OF NEW PUNCHES

The unique Cone Lock punch retaining method is the key to Pivot Punch & Die Corp.'s new line of removable punches. The expanding Cone Lock, which fits into a countersunk hole in the retainer plate, makes punch insertion easy, punch retention rigid and accurate, and punch removal fast when a combination turning-pulling action is used.

The retainer plates don't require "built-in" devices to hold the punches with the Cone Lock system. After countersinking the top of each punch hole and seating the expanding ring-like Cone Lock, the die's ready for a hardened back-up plate and the die set. Then the punches are quickly inserted.

Unlike previously used retainers or removable punches, Cone Lock retainers do not require hardening. They're readily machinable, which can mean real savings in manufacturing costs, as well as facilitate changes in punch location. Retainer thickness, too, can be held to a minimum, which is of special advantage where heavier piercing operations are encountered.



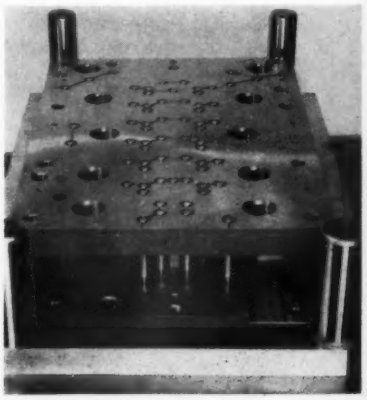
Cone Lock punch ready for insertion in retainer plate. Expandable Cone Lock holds punch tightly, allows fast removal.

The design of the punch used in the Cone Lock system, says Pivot's President Robert King, offers as much strength and holding power as head or shoulder type punches. The angular bearing surface goes completely around the periphery of the head section, which helps resist fracturing. This design, too, is unique with Cone Lock.

Ansco die shows how expandable Cone Locks fit angular bearing surfaces.

Pivot Punch & Die Corp. has made several successful dies already with Cone Lock punches. The one illustrated is for piercing 70 holes in 0.125″ thick CRS stock for Ansco. The punches range from 0.159″ to 0.251″ dia.

Engineering specifications and templates for these new removable punches can be obtained by writing Pivot, North Tonawanda, N.Y., or by circling No. W2 on the Inform-A-Gram card in this issue.



Cone Lock removable punches inserted in retainer plate, ready for addition of back-up plate and die shoe.

Every Day ADDS to Your PROFITS when You Operate with PERKINS Jr. PRESSES!

It is hard to find a small press that will equal the performance of Perkins Junior Press, for POWER, SPEED, ECONOMY, VERSATILITY and year-in-year-out DEPENDABILITY. Dollar-wise, they're the most economical press you can buy.

Perkins Presses are being profitably operated today in some of the largest metal working plants in the country. There's a model to fit your particular requirements.

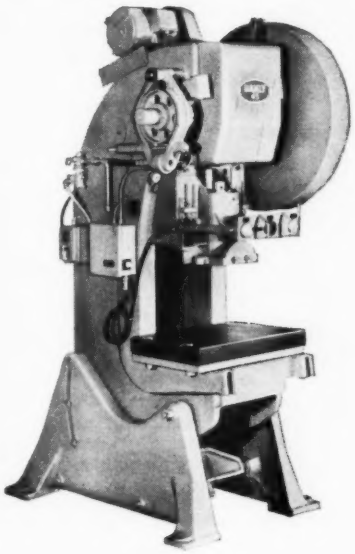
WRITE DEPT. TP11 for illustrated brochures with complete specifications. It's the first step towards economical production.

PERKINS
MACHINE COMPANY
WARREN, MASS., U.S.A.

CIRCLE INFORM-A-GRAM KEY NO. 74

The Leading Supplier to the Stamping Industry

in PRESSES



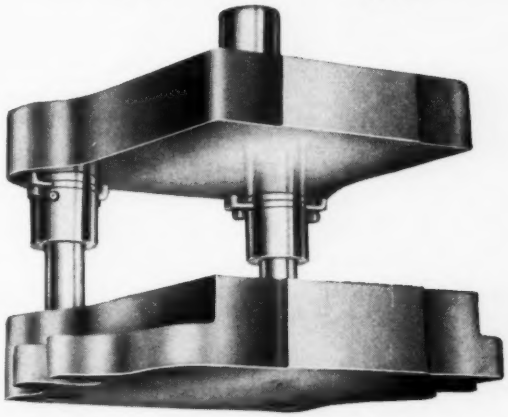
The report of the Business and Defense Service Administration shows that Danly led all producers of presses during 1957. Industry made Danly the first choice because you get lower operating costs with a Danly Press—you can depend on it! Each press is engineered to turn out more accurate stampings . . . to produce more units per shift . . . and to reduce profit-eating maintenance and spare parts inventories.

There are many new developments you should know about, such as the Quick Die Change feature available on all Straight Side Presses . . . single, double and triple action . . . the modern high-production Autofeeds . . . and the completely modern line of Open Back Inclinable presses just introduced. See how Danly can help you reduce costs and give your products the stamp of leadership!

Shown above: *New Danly O.B.I. Press.* Each model of this new press line (25 to 200 tons) has the exclusive Danly Air Clutch and Brake to assure continuous production and long press life.

Write for new O.B.I. Press catalog that gives complete information on features and specifications of these reasonably priced presses.

in DIE SETS
and Die Makers' Supplies



Danly is now working on its fifth million in die set production. Included in this production are many die sets for the automotive industry—that are working in that industry in its multi-million car production of today.

In every instance, Danly can meet your most exacting diemaking specifications with a die set—standard or special. Since pioneering the first mass-produced precision die sets 36 years ago, Danly has continuously developed new production, inspection and distribution methods to serve you better.

Today, there's the new Danly Die Set with Demountable Bushings being assembled in a factory branch or distributor assembly plant near you. It is your fast, convenient source for toolroom and pressroom supplies that bear the stamp of leadership. Danly facilities for special Die Set manufacture are also improved and expanded

Shown above: *New Danly Demountable Bushing Die Set*—the most accurate Die Set on the market today. The ease of assembly and disassembly offers important advantages in die making and die maintenance.

Send for money-saving facts. Write us and your distributor or branch will give you helpful information on Danly Die Sets.

DANLY MACHINE SPECIALTIES, INC. 2100 S. Laramie Avenue, Chicago 50, Illinois

Gaertner Toolmakers' Microscope used to measure typical piece part. Co-ordinate range 4" x 2".

Precise measurement to 0.0001" and 1 min. of arc

Gaertner Toolmakers' Microscope

Here is a reliable, easy-to-use microscope for precise measurement of piece parts, tools, dies, thread gages, templates, jigs, fixtures, etc. Ideally suited for making a wide variety of precision measurements and is especially valuable in reducing rejects in production work.

With the Gaertner Toolmakers' Microscope you make direct, non-destructive measurements — no contact, no distortion, images are sharp and clear. It is a basic measuring instrument for inspection depts., gage labs, tool and die and model shops, industrial and research labs.

The Gaertner Toolmakers' Microscope has been proven in use by U. S. Government Gage Laboratories, and by prime contractors and their subcontractors. With all parties using the same measuring instrument, inspection procedures are co-ordinated and disagreements and rejects minimized.

Features that help you get
HIGH SETTING AND REPEATING ACCURACY

- Low, compact built-in rotary stage reads to 1 minute of arc throughout 360° range.
- Minimum overhang of stages.
- Full 2" precision-lapped lead screws with correction device.
- Straightforward, direct, uncomplicated optical system.

Features that assure you of
EASY, CONVENIENT OPERATION

- Independently rotatable cross hairs in protractor ocular speed up measurements, simplify measuring procedure.
- Convenient location of ocular eyepieces for ease of reading.
- Built-in transformer and plugs for all illuminators.

Modifications and accessories to
MEET YOUR EXACT REQUIREMENTS

- Thread and radius templates, camera and spotting attachments, fine motion focus, variable magnification available.
- If you have a special measuring problem, our staff of representatives will be happy to consult with you. The service and engineering facilities of the manufacturer are always immediately available to help you.

Write for Bulletin 147-56

Designed and manufactured by

The Gaertner Scientific Corporation

1242 Wrightwood Ave., Chicago 14, Ill.
Telephone: BUckingham 1-5335

CIRCLE INFORM-A-GRAM KEY NO. 761

Products & Processes

PROCESSES & PRODUCTS & PROCESSES & PRODUCTS & PROCESSES & PRODUCTS

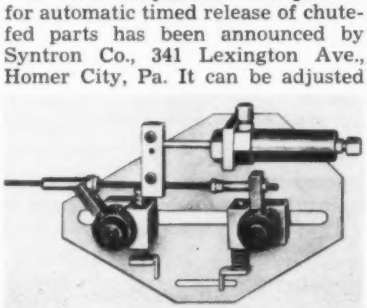
A New Improved Safety Multiple Lockout is made from extra heavy-duty ⅛" hard steel. When two or more men are working on the same power source, each puts a lock on this lockout and removes it when work is finished. Power cannot be turned on until all locks are removed. For bulletin, write Dayton Rogers Mfg. Co., Minneapolis 7, or Circle Inform-A-Gram No. A1.

For Close Control of Temperature in processing metals use electric resistance heaters produced by The Herscott Co., 2500 N. Main St., Rockford, Ill. Consist of resistance heater, temperature sensing head,

and recording controller. Use for forming, drawing, shearing, or other punch press or press work. Write company for more information, or Circle No. A2.

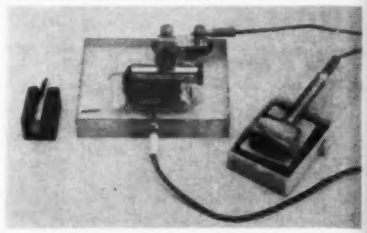
Advantages of Turret-Type Indexing Chassis for special purpose processing and assembly machines are illustrated and explained in a brochure. It points out features, gives dimensional specifications and operational data, and shows applications. Get a copy from Swanson-Erie Corp., 814 E. 8th St., Erie, Pa., or Circle Inform-A-Gram No. A3.

A New Adjustable Escapement for automatic timed release of chute-fed parts has been announced by Syntron Co., 341 Lexington Ave., Homer City, Pa. It can be adjusted



quickly and easily to fit changing parts requirements and can also be used on different chutes. Write to company for information, or Circle Inform-A-Gram No. A4.

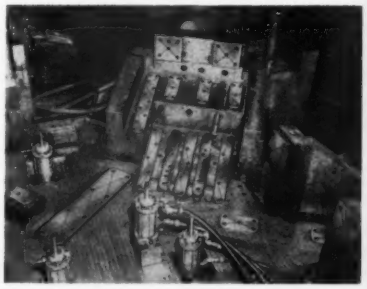
Mark Small Diameters of drills, reamers, and end mills with the aid of a new lettering bench fixture. Model B-1220 features contoured top plate, holds part firmly in position



to eliminate blurring, and permits deeper letters. Used with Model 505 controlled-etch power unit, it'll etch to 0.002" depth. Monode, Inc., Cleveland 15, or Circle Inform-A-Gram No. A5.

Select Magnifiers and Readers from a simplified catalog from Bausch & Lomb Optical Co., 635 St. Paul St., Rochester 2, N.Y. Covers 65 individual models including round and rectangular readers, folding pocket magnifiers, and surface comparators. Specifications are included for each. Get Catalog I-52 from the company, or Circle Inform-A-Gram No. A6.

Aluminum Wear Plates have ¼" of aluminum bronze bonded to a tough, easily machinable steel backing for increased wear properties. Used as slides in cam dies, or wherever there's sliding action between



flat metal parts. Available in from ½" to 1¼" thickness, 1½" to 8" widths, and 72" lengths. Get data sheets from The Ohio Knife Co., Dept. LL-90, Cincinnati 23, Ohio, or Circle Inform-A-Gram No. A7.

WHERE TO FIND . . .

Inspection	80
Pneumatics & Hydraulics	84
Plastics	86
Materials	86
Grinding & Finishing	88
Toolroom	90
Pressworking	92
Assembly	96
Machining	100

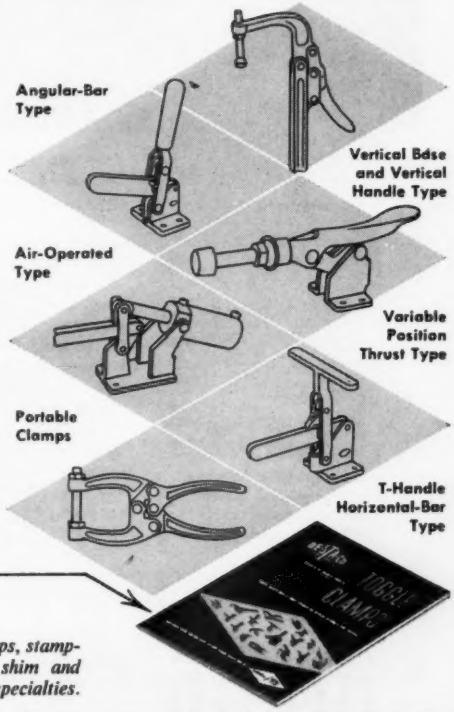
CIRCLE INFORM-A-GRAM KEY NO. 77→

Where It's Quality, Quality, Quality!
It's Quality DE-STA-CO Toggle Clamps

FINAL INSPECTION OF ROSS OPERATING VALVES subjects every valve to a pressure test far exceeding its normal usage. For over fifteen years, fixtures similar to this, all employing De-Sta-Co No. 620 plunger clamps, have been built to do this critical high pressure sealing job.

Whether your holding and clamping operation is inspection, machining, tapping, grinding, welding, bonding or other assembly, there is a specific De-Sta-Co Toggle Clamp to do it better. Fast action, positive clamping, long life through thousands of production operations have made De-Sta-Co known for almost 30 years as the leading tool in the field. And every one of our 120 models uses hardened serrated pins in hardened bushings staked to prevent wear. A broad selection of spindle accessories increases the versatility of the clamp you specify.

Our representative in your area is qualified and ready to serve you. Send for our 40 page catalog showing clamp applications, scale drawings and complete information.



De-Sta-Co is widely known for toggle clamps, stampings, precision washers, spacers, shims, shim and feeler stock, blower housings and marine specialties.

DE-STA-CO

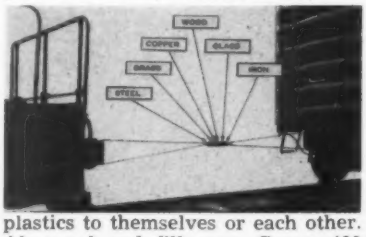
ORIGINATORS OF PRODUCTION CLAMPING

DETROIT STAMPING COMPANY

344 MIDLAND AVENUE • DETROIT 3, MICHIGAN

Products & Processes

High Strength Epoxy Bonding Agents cement cast iron, steel, copper, aluminum, bronze, brass, and



plastics to themselves or each other. Also seal and fill gaps. Cepox 400 Series adhesives produce tough, water-insoluable bond that resists most chemicals. Details from Chemical Development Corp., Danvers, Mass., or Circle Inform-A-Gram No. A8.

Machinable Heat Shock Resistant Ceramic Rods and Discs are now available in Grade HT-2-M, suitable to 2200°F. Available in 9/16" to 2¼"

dia and 1" lengths. Withstands rapid temperature changes without cracking or spalling. Duramic Products, Inc., 262-72 Mott St., New York 12, or Circle Inform-A-Gram No. A9.

Advances of Chemically Milled Steel Alloys are discussed in a bulletin which describes the materials being chemically milled and the effect on heat treating, physical properties, surface finishes, and tolerances. Get Design Bulletin 8 from United States Chemical Milling Corp., 1700 Rosecrans Blvd., Manhattan Beach, Calif., or Circle A10.

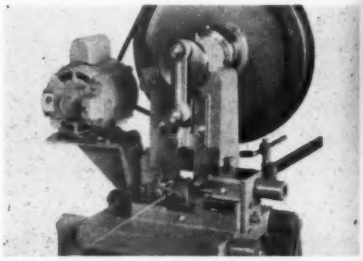
This Brehm Tube Cutting Machine has over 7000/hr cutting rate, depending on part length, and produces burr free edges and little part distortion. Cutting of almost all materials performed by shearing action

so there's no scrap loss and no blades to sharpen. Vulcan Tool Co., 730 Lorain Ave., Dayton 10, Ohio, or Circle Inform-A-Gram No. A11.

A Rust Prevention Booklet gives information on rust, its causes, and applications of preventives. Includes data on various types of Rust-Lick rust preventing liquids, recommended applications, and graphs of rust preventing qualities. Get Booklet from Rust-Lick, Inc., 755 Boylston St., Boston 16, or Circle A12.

Marking Machines and marking tools are described in a 36-page catalog from Noble & Westbrook Mfg. Co., Westbrook St., E. Hartford 8, Conn. It shows types of products that can be marked and how it is done on different types of machines. Specifications for machines and heads from the company, or Circle A13.

Up to 235 Pieces of Tubing/min that is flared without burring can be produced by a high-speed tube cutting machine. Model 500 handles



workpieces as short as 1½", holds this length to ±0.005" with parallel faces, and cuts most materials. Novi Tool & Machine Co., 25806 Novi Rd., Novi, Mich., or Circle A14.

CONTOUR GRIP

SET UP ANY JOB IN SECONDS
then take deeper cuts, faster feeds

on a lathe...Contour Grip works with any two, three or four jaw chuck, wrench or air operated.

on a milling machine ...Contour Grip makes high speed milling of tough-to-hold parts easy.

on a grinder...this multiple set-up on a Blanchard helped a manufacturer increase his output ten-fold!

Any tool becomes more productive when you use Bliss' new Contour Grip holding fixture; any operator becomes faster.

Contour Grip is a standard fixture that will hold any irregularly shaped part so tightly that you can feed faster and take deeper cuts. It can be used with *any* type of tool, eliminating the need for costly special-purpose jigs and fixtures. And, as picture above shows, your operator can set-up Contour Grip in seconds, then go from piece to piece just by backing off the jaws, dropping the next piece in and tightening up. For long runs or short, it's as simple and as quick as that.

The key to this all-purpose holding fixture's versatility is its individual steel fingers, each of which moves independently as it contacts the work. The fingers mold around the part, and then tighten up *giving greater holding power and a more positive grip than any ordinary fixture can.*

To learn how Contour Grip works and to see the various models available, see your local dealer or contact us direct.

SEND FOR BULLETIN

dieco DIE SETS

E. W. BLISS COMPANY
DIE SUPPLY DIVISION
Cleveland, Ohio

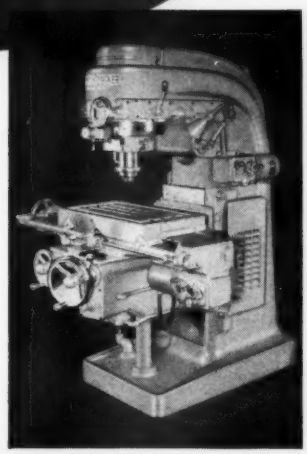
CIRCLE INFORM-A-GRAM KEY NO. 78

Die/namic Design lets you translate blueprints into metal in one setup

Kearney & Trecker MODEL D

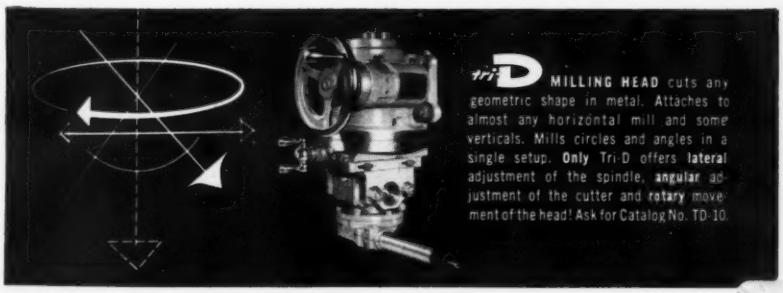
ROTARY HEAD MILLING MACHINE

Change job planning time into profitable production time! Simplify and speed close-tolerance milling of tools, dies, molds and parts having multiple radii — on Die/namic-designed Kearney & Trecker Model D Rotary Head Mill. It ideally combines precise mechanical control of spindle offset and rotary head motion, so that straight, angular and radial movements can be effected — all in a single setup. In production work, Model D eliminates jigs, fixtures, models and templates. For facts, see your nearest Kearney & Trecker representative or write direct.



AVAILABLE ON TOOL LEASE

Conserve capital, reduce machine obsolescence — check into K&T's Tool Lease Program. Choose the machine you need from nearly 350 different standard milling and precision boring machines.



Tri-D MILLING HEAD cuts any geometric shape in metal. Attaches to almost any horizontal mill and some verticals. Mills circles and angles in a single setup. Only Tri-D offers lateral adjustment of the spindle, angular adjustment of the cutter and rotary movement of the head! Ask for Catalog No. TD-10.

DESIGNERS AND BUILDERS OF PRECISION AND PRODUCTION MACHINE TOOLS SINCE 1898.

6776 W. National Avenue • Milwaukee 14, Wis.

KEARNEY & TRECKER MILWAUKEE ®

CIRCLE INFORM-A-GRAM KEY NO. 79

Inspection

PROCESSES & PRODUCTS & PROCESSES

A Super-Compar Gaging Head has direct reading in 0.0000020″ increments and accuracy of ten-millionths over the dial range of ±0.001″. For more information write Mahr Gage Co., Inc., 274 Lafayette St., New York 12, or Circle Inform-A-Gram No. B1.

An Automatic Piston Inspection Machine, that can inspect up to 2600 pistons/hr, is described in a bulletin. Other features of Model 1048, and application and operational data are included. Get Bulletin A.1075 from Radio Corp. of America, Industrial Automation Equipment, 12605 Arnold Ave., Detroit 39, or Circle Inform-A-Gram No. B2.

Use of X- and Gamma Rays for nondestructive inspection and product testing are completely described and illustrated in a 12-page booklet. "Are You In This Profit Picture?" gives advantages and disadvantages of these methods and shows examples of applications. Picker X-Ray Corp., 25 S. Broadway, White Plains, N.Y. or Circle No. B3.

☆ ☆ ☆

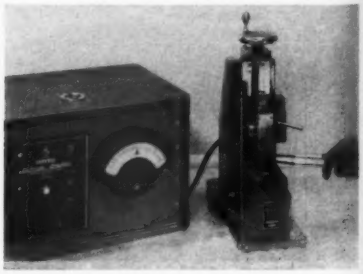
A New 23-Piece Set of Rectangular Ultra Thin Carbide Gage Blocks is available from Fonda Gage. Set provides sizes from 0.010″ to 0.100″ as a supplement to standard larger

sets and is especially useful for measuring tiny screws and fittings. Write to Fonda Gage Co., 200 Henry St., Stamford, Conn., for details, or Circle Inform-A-Gram No. B4.

☆ ☆ ☆

A Borescope Data File contains descriptions of many different types and shows many uses to bring internal defects into clear view. The borescopes are used to inspect internal areas that have a point of entry of 0.10″ dia or larger. Get a file from National Electric Instrument Div'n, Englehard Industries, Inc., 92-21 Corona Ave., Elmhurst 73, N.Y., or Circle No. B5.

Dimensional Variations of up to 0.000001″ in gage blocks and other small parts can be detected by an electronic comparator announced by Federal Products Corp., Providence, R.I. Model 130 B-12 accurately measures up to 4″ gage blocks and its



electronic amplifier provides four magnifications. Precision ground reference platen, fitted with two sets of three balls, provides accurate three-point reference surface. Get Data Sheet 130 B-12 from the company, or Circle No. B6.

2738

Hamilton

SUPER SENSITIVE DRILLING MACHINES

This is the Hamilton Varimatic® Super Sensitive Precision Drilling Machine equipped with "tool-room base" and compound table.

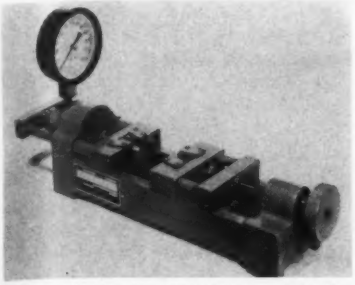
THE HAMILTON TOOL COMPANY

832 SOUTH NINTH STREET · HAMILTON · OHIO

CIRCLE INFORM-A-GRAM KEY NO. 80

Inspection

Portable Tensile Testers for round or flat specimens have been announced by Steel City Testing Machines, Inc., 8817 Lyndon Ave., Detroit 38. Model THM- is available in



100 to 1000 lb-capacitities, with the applied load indicated on a 4½" dia gage. Get details from the company, or Circle No. B7.

For Measuring Surface Finish, use the Profilometer line of equipment. A new 12-page revised catalog illustrates and describes all available instruments and gives dimensional drawings and complete specifications on each item. Get your copy from Micrometrical Mfg. Co., 345 S. Main St., Ann Arbor, Mich., or Circle Inform-A-Gram No. B8.

New Tri-Lock Plug Gage Sets come in free steel cabinets and have a tolerance of ±0.00007". Line includes sizes from 0.750" to 1" in increments of 0.001", for a total of 251

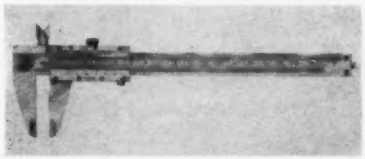
sizes. Each member is completely reversible providing double gage life. Write Dundick Tool Works, Inc., 3410 W. 31st St., Chicago 23, for details, or Circle No. B9.

Universal Fixture for checking gears, hobs, and cutters is outlined in a bulletin. Model 471 fixture can be used on axial lead of worms; OD and concentricity of worms and worm blanks; and for checking milling cutters and form tools for flute spacing. Bulletin 471 is available from Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, or Circle No. B10.

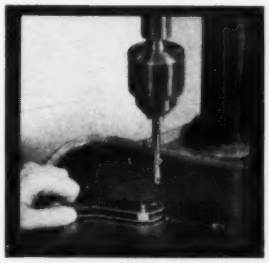
"Black Granite Gaging Products" features a selector chart listing 432 combinations of plate sizes, ledges, and over-all accuracies, to simplify surface plate selection. Three different grades are offered. Get your catalog from The DoAll Co., Des Plaines, Ill., or Circle No. B11.

A New Measuring Instrument Line is described in a bulletin which gives dimensions of comparators, depth gages, and magnetic base indicator supports. Applications and operational data on the Pet-line is included. Write to Petz-Emery, Inc., Pleasant Valley, N.Y., for a copy of Bulletin E, or Circle B12.

This Precision Vernier Caliper features flush back jaws and extra long fully-adjustable vernier plates. Model 17 Etalon caliper is dull chrome plated and won't chip or

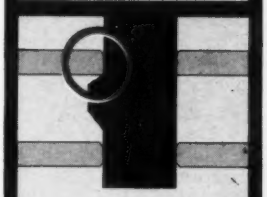


peel. It's easy to read with inside, outside, and depth measurements read from the same scale. Alina Corp., 122 E. 2nd St., Mineola, L.I., N.Y., or Circle B13.



DEBURRING COSTS CUT 2/3 ON THIS PART!

Spring-loaded Burraway blade chamfers top edges on down-stroke, depresses to pass through stock.



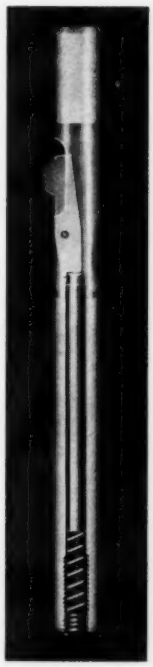
On up-stroke, Burraway blade chamfers under edges. Four edges in just one pass!

One pass of the Cogsdill Burraway tool chamfers four hole edges on this stamped handle. The job previously required four separate passes—two with a right-angle chamfer, two with a standard tool.

Burraway's spring-loaded blade adjusts for light deburring or up to ⅛" chamfer. On down-stroke, just enough pressure exerts to catch the edge; the blade then depresses to pass through the stock. On up-stroke, the under-edge is similarly chamfered.

Burraway works in any head, on automatics or multiple-spindle machines to eliminate many hand or secondary operations. Its costs are often returned the first day. If you debur or chamfer, you need Burraway.

FOR THE ASKING—Complete Cogsdill catalog on Burraway, Baksink, Bearingizing and other time-saving tooling.

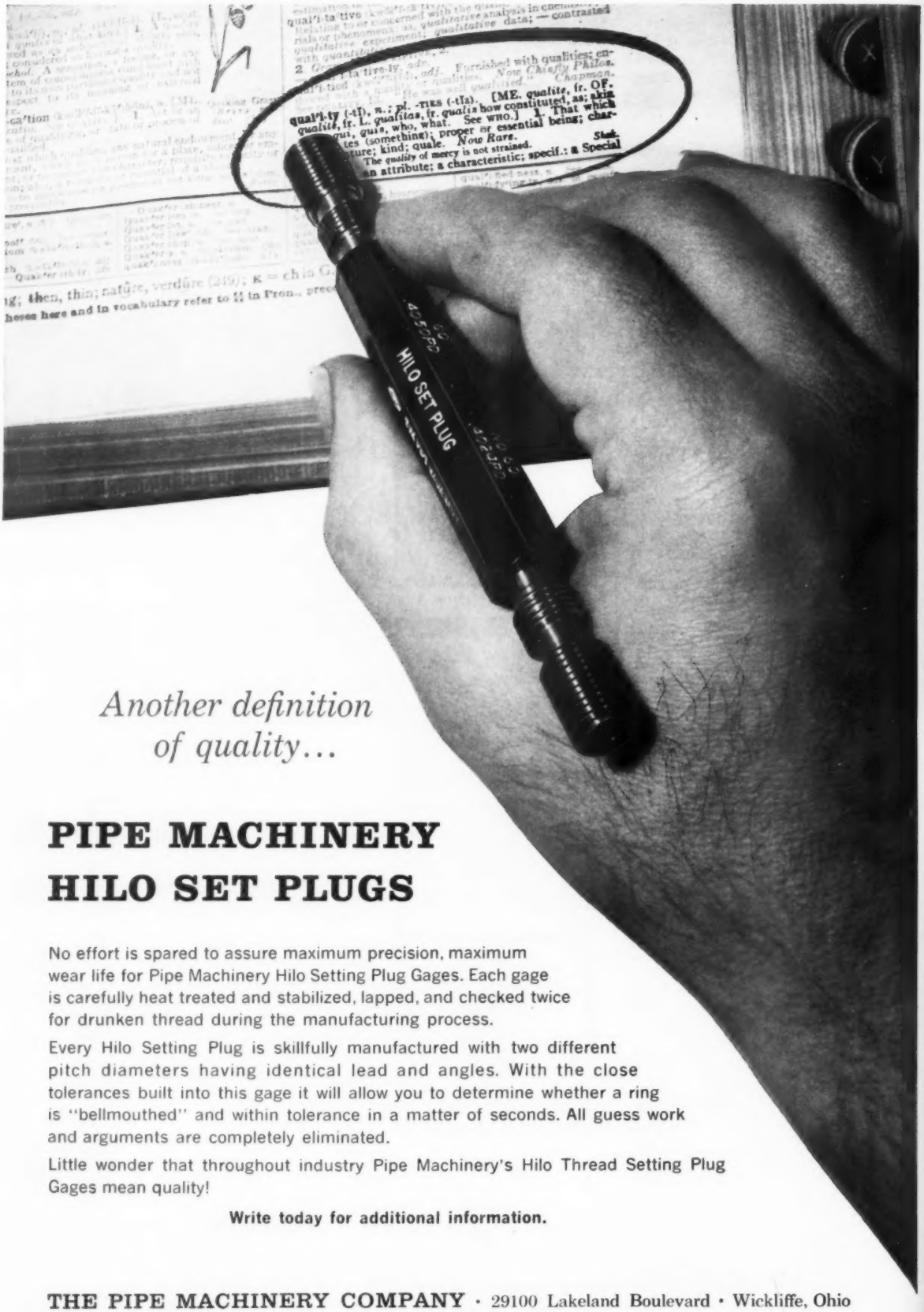


Cogsdill

TOOL PRODUCTS, INC.

12978 W. EIGHT MILE RD., OAK PARK 37, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 81



Another definition of quality...

PIPE MACHINERY HILO SET PLUGS

No effort is spared to assure maximum precision, maximum wear life for Pipe Machinery Hilo Setting Plug Gages. Each gage is carefully heat treated and stabilized, lapped, and checked twice for drunken thread during the manufacturing process.

Every Hilo Setting Plug is skillfully manufactured with two different pitch diameters having identical lead and angles. With the close tolerances built into this gage it will allow you to determine whether a ring is "bellmouthed" and within tolerance in a matter of seconds. All guess work and arguments are completely eliminated.

Little wonder that throughout industry Pipe Machinery's Hilo Thread Setting Plug Gages mean quality!

Write today for additional information.

THE PIPE MACHINERY COMPANY · 29100 Lakeland Boulevard · Wickliffe, Ohio

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TOOLING & PRODUCTION:
Please have information on items circled sent to me.

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COMPANY ADDRESS _____

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5	24	67	95	874	962	1041	1102
6	26	68	99	875	963	1042	1103
7	27	69	107	901	971	1043	1111
8	28	70	115	911	972	1044	1112
9	29	71	116	912	973	1045	1113
10	30	73	251	913	981	1051	1114
11	31	74	252	914	982	1052	1121
12	32	75	621	915	983	1053	1131
13	34	77	622	916	1001	1061	1132
14	51	78	761	921	1011	1062	1133
15	53	79	851	931	1012	1063	1134
16	55	80	852	932	1013	1081	1141
17	56	81	853	933	1014	1082	1142
18	59	82	861	934	1021	1091	1143
19	61	83	862	941	1022	1092	

EDITORIAL ITEMS

A1	B5	E1	G1	H12	K1	K19
A2	B6	E2	G2	H13	K2	K20
A3	B7	E3	G3	H14	K3	K21
A4	B8	E4	G4	J1	K4	K22
A5	B9	E5	G5	J2	K5	K23
A6	B10	E6	G6	J3	K6	K24
A7	B11	F1	G7	J4	K7	K25
A8	B12	F2	H1	J5	K8	K26
A9	B13	F3	H2	J6	K9	K27
A10	C1	F4	H3	J7	K10	K28
A11	C2	F5	H4	J8	K11	W1
A12	C3	F6	H5	J9	K12	W2
A13	C4	F7	H6	J10	K13	
A14	C5	F8	H7	J11	K14	
B1	C6	F9	H8	J12	K15	
B2	D1	F10	H9	J13	K16	
B3	D2	F11	H10	J14	K17	
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THESE INFORM-A-GRAM CARDS are for the convenience of TOOLING & PRODUCTION readers who, we know, rarely have stenographic help at their beck-and-call while reading. To get further information concerning selected items featured — all one needs is an INFORM-A-GRAM card and a pencil or pen to circle the numbers of the items wanted. If there is no identifying number, use the page number.

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A6	B10	E6	G6	J3	K6	K24
A7	B11	F1	G7	J4	K7	K25
A8	B12	F2	H1	J5	K8	K26
A9	B13	F3	H2	J6	K9	K27
A10	C1	F4	H3	J7	K10	K28
A11	C2	F5	H4	J8	K11	W1
A12	C3	F6	H5	J9	K12	W2
A13	C4	F7	H6	J10	K13	
A14	C5	F8	H7	J11	K14	
B1	C6	F9	H8	J12	K15	
B2	D1	F10	H9	J13	K16	
B3	D2	F11	H10	J14	K17	
B4	D3	F12	H11	J15	K18	

Which article in this issue was of most interest to you? _____

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TOOLING & PRODUCTION MAGAZINE

P. O. BOX 3505

CLEVELAND 18, OHIO

***Experience**—the added alloy in **Allegheny Ludlum** tool steels*

Careful addition of sulfur to melt guarantees typical sulfide distribution, as shown in photomicrograph of longitudinal specimen of EZ MACHINING tool steel.

Sulfur addition to melt held to narrow range in Allegheny Ludlum's EZ MACHINING GRADES

Uniform, finely-distributed sulfides mean uniform machining, uniform high finish, uniform long tool life order after order

Adding sulfur, actually an impurity, to a tool steel melt to make it free-machining must be done with care and precision. That's why Allegheny Ludlum maintains an extremely close average range in adding sulfur to its EZ MACHINING grades. But mere range, however narrow, is not enough. A-L has developed special techniques in adding sulfur and nucleating agents to produce the uniform, finely-distributed sulfides that characterize good free-machining tool steels.

A-L's extra care means you can standardize your machining operations from piece to piece and order to order. This reproducibility is reflected in uniform *machining;* uniform *high finish;* uniform *long tool life.*

For example, in the production of hobs these machining properties in Allegheny Ludlum's EZ MACHINING steels minimize the costly "backing off" operation for back clearance of multiple teeth, eliminating complicated extra heat treatment. Lower residual stresses are set up, because the steel has a lower resistance to the cutting action. Naturally, hobbing is only one of the situations where these free-machining characteristics can benefit you.

Allegheny Ludlum stocks a complete line of tool steel sizes and grades. Call your nearest A-L representative; you'll get quick service and counsel on such problems as heat treating, machining, grade selection, etc. Or write for A-L's publication list which gives full data on the more than 125 technical publications offered. They'll make your job easier.

ALLEGHENY LUDLUM STEEL CORPORATION, Oliver Building, Pittsburgh 22, Pa. Address Dept. TP-19

WSW-7259

ALLEGHENY LUDLUM

Tool Steel warehouse stocks throughout the country... Check the yellow pages

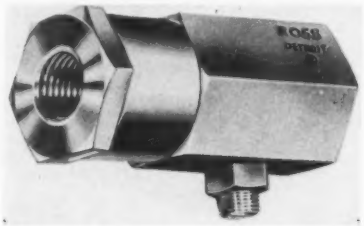
every grade of tool steel... every help in using it

CIRCLE INFORM-A-GRAM KEY NO. 83

Pneumatic & Hydraulics

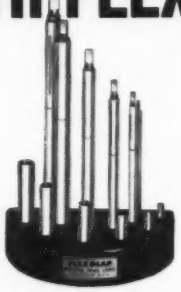
PRODUCTS & PROCESSES & PRODUCTS & PROCESSES & PRODUCTS & PROCESSES

The Cub Lightweight Speed Control Valve offers a metering adjustment which permits five full turns from closed to full open position. A short installation radius and small envelope dimensions make it ideal for limited space installations. Handles 0 to 150 psig air service. Ross Operating Valve Co., Detroit 3, or Circle Inform-A-Gram No. C1.



Double-Acting Air Motors, both electrically- and air-controlled, are discussed in a catalog from Air Control Div'n, Lehigh, Inc., 1500 Lehigh Dr., Easton, Pa. It gives complete dimensions of 1½" to 5" bore sizes. Get a copy from the company, or Circle Inform-A-Gram No. C2.

LAP FASTER
more accurately WITH FLEXOLAP



Flexolap features an expansion barrel with off-center longitudinal slots that "give" under pressure of the adjusting pin —allow up to 15% expansion. Easy, accurate take-up saves valuable time, enables you to lap rounder, straighter holes. Extra flexibility eliminates danger of galling or seizing.

SET NO. 1

includes 6 complete laps, one of each size (3/16", ¼", 5/16", 3/8", 7/16" and ½"), and one additional brass barrel of each size, all on a sturdy stand. $14.00

OTHER SIZES

available are 7/32", 9/32", 11/32", 13/32", 15/32", 9/16", 5/8", 11/16", ¾", and Midget Laps in sizes .032, .036, .040, .046, .054, .062, .070, .079, .090, .104, .120, .135, .155, .170, .187, .218 and .250. Trial assortment of 17 midget laps, $2.10

Write today for free catalog

FEDERAL TOOL CORPORATION
3600 W. Pratt Blvd., Chicago 45, Illinois

CIRCLE INFORM-A-GRAM KEY NO. 84

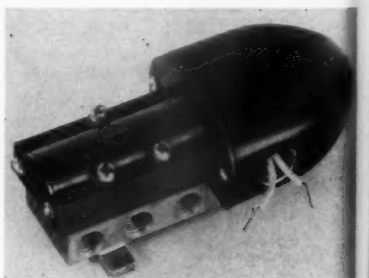
A New Hannifin Air Motor Line is described in a bulletin which covers features and specifications for the five bore sizes available in each of four mounting styles. Operating

data is also included. Write Hannifin Co., Dept. 164, 501 S. Wolf Rd., Des Plaines, Ill., for a copy of Bulletin 215, or Circle Inform-A-Gram No. C3.

Three- or Four-Way Air Powered Valves, are featured in a catalog that also includes data on electrical equipment, electric wiring, and air control equipment. Dimensions and detailed installation drawings are given for each type. Write to Lehigh Foundries, Inc., Easton, Pa., for your copy, or Circle Inform-A-Gram No. C4.

Over 200 Solenoid Valves, bronze and stainless steel construction, are listed in a 31-page catalog that gives detailed dimensions, installation and operational drawings, features, and applications. For Catalog 444, write Atkomtic Valve Co., Inc., 545 W. Abbott St., Indianapolis 25, Ind., or Circle Inform-A-Gram No. C5.

A New ¼" Four-Way Valve has been added to the line of Alkon Products Corp., 200 Central Ave., Hawthorne, N.J. It features sub-base mounting as standard and is rated at 200 psi or vacuum air service.

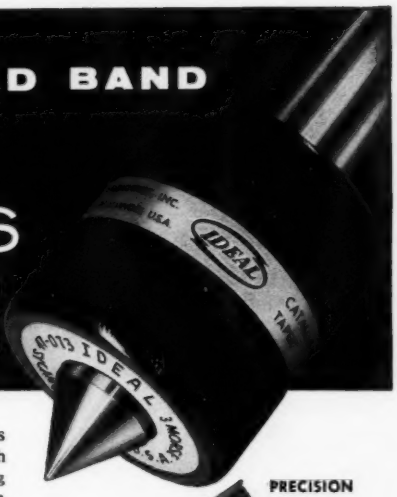


Model A valves have 0.000050" precision tolerances for consistant sealing characteristics. Get details from the company, or Circle Inform-A-Gram No. C6.

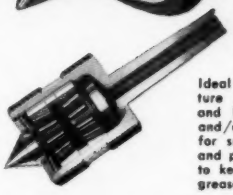
IDEAL GOLD BAND

LIVE CENTERS

GUARANTEED TO MATCH OR EXCEED, "CRITICAL" JOB SPECIFICATIONS



In the GOLD BAND line Ideal has combined the latest production methods with their traditionally fine craftsmanship to bring you an unequalled standard of excellence in live centers. Accurate, (to ± .0001") GOLD BAND Live Centers offer "custom" quality at production prices. Specify GOLD BAND Live Centers and your every need can be accommodated from stock . . . 99 times out of 100. Ideal's GOLD BAND Live Centers offer savings, simplified operations and higher lathe output both in quantity and quality. Contact your distributor today...or



PRECISION FITTED BEARINGS

Ideal Live Centers feature precision machined and hardened ball and/or roller bearings for superior accuracy and performance. Sealed to keep dirt out, grease in.

A COMPLETE LINE FOR EVERY NEED...SPECIALS, TOO!

Send for
Complete catalog data and specifications.

IDEAL INDUSTRIES, Inc.
1334-G Park Ave., Sycamore, Ill.

DISTRIBUTED BY THE NATION'S LEADING INDUSTRIAL DISTRIBUTORS

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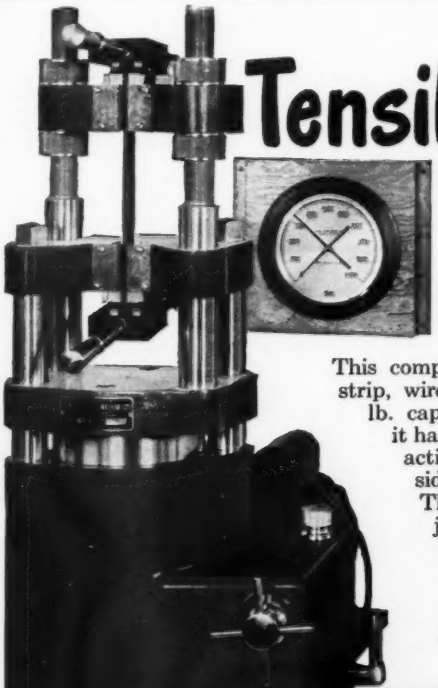

Tensile Testing

Fast!
Accurate!
Easy!

This compact machine tests spotwelds, strip, wire, anything within its 20,000 lb. capacity. Hydraulically powered, it has an easily controlled ram, self-acting specimen grips that are open sided for easy specimen insertion. This tester, Model ST-1, is adjustable to take specimens 5" to 9" in length. Various load gauges, grips, and other modifications are available.

Write for more information— give us your requirements.

DETROIT TESTING MACHINE COMPANY

9386 Grinnell Ave., Detroit 13, Mich.

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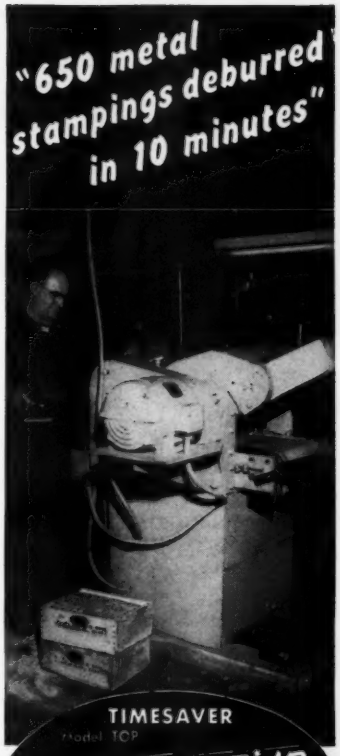

V. A. BOKER & SONS, Minneapolis, Minn., manufacturer of precision metal stampings reports:

"We processed 675 metal stampings using a Speedbelt 12 and 2 men in 1 hr. 40 mins. or 3 hrs. 20 mins. of direct labor charged against the job. By old deburring methods this run would have taken in excess of 20 hours. Another run of 650 metal stampings was completed in 10 mins., or 20 mins. direct labor compared to 4 hrs. by former deburring methods. These runs are typical of the savings in production time we have made on this type of work. We also find we are achieving a much better finish as well."

TIMESAVER "SPEEDBELT" SANDERS CAN HELP CUT YOUR PRODUCTION COSTS . . . TOO!

V A. Boker & Sons' experience is typical of the many installations where versatile, low-cost Timesaver "Speedbelt" Sanders have replaced slow, costly deburring, finishing and polishing methods. Timesaver Sanders are built in 12", 18", 24", 38", 50" and 54" models . . . a size and type to solve most polishing, finishing and deburring operations on solid or perforated aluminum, stainless steel and other metal sheets, bars and blanks.

INVESTIGATE the advantages of these amazing machines and hi-speed abrasive belt operations for your shop. Write for literature today.

TIMESAVER SANDERS
Box 7446, Robbinsdale Station
Minneapolis 22, Minn.

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DEPENDABLE ACCURACY

INSPECTION TOOLS made of MEEHANITE METAL are designed to fill your various Inspection and Checking needs. Sturdily constructed to give you reliable, accurate service.

ACME TOOL CORP.
75 W. Broadway New York 7, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 861

TOMCO INC.

HAND WHEELS

Straight Type Offset Type

SPECIALS

- HAND KNOBS
- MACHINE HANDLES
- HANDLES
- BALL HANDLES
- LEVERS
- SPECIALTIES

GRADUATED DIALS

SPECIFY TOMCO FOR DEPENDABILITY

A Complete line of high grade hand knobs, levers, handles, hand wheels, graduated dials is available for immediate shipment from stock of standard items. Specialty items made to your specifications.

WRITE FOR INFORMATION
TOMCO INC.
RACINE 2, WIS.

CIRCLE INFORM-A-GRAM KEY NO. 862

Plastics

PRODUCTS & PROCESSES & PRODUCTS

A New Epoxy Paper-Base Laminated Plastic has excellent flame resistance, good cold punching qualities, and better electrical properties and dimensional stability than XX-XP types. Grade EP-491 was design-

ed for strict printed circuit requirements of computer manufacturers. Get literature from National Vulcanized Fibre Co., 1059 Beech St., Wilmington 99, Del., or Circle Inform-A-Gram No. D1.

Hydraulic Vertical Injection Molding Machines are outlined in a bulletin which lists features and gives specifications for 1, 2, 6, 16, and 24 oz machines. Bulletin 627-B is compiled by Watson-Stillman Press Div'n, Farrel-Birmingham Co., Inc., 109 Aldene Rd., Roselle, N.J., or Circle Inform-A-Gram No. D2.

Machinery for Molding Plastics, including injection, compression, transfer, and reinforced plastics molding presses, and special machines are presented in a bulletin.

Illustrations show each machine and types of possible applications. The Hydraulic Press Mfg. Co., A Div'n of Koehring Co., Mt. Gilead, Ohio, supplies Bulletin 5830-A, or Circle No. D3.

Materials

PROCESSES & PRODUCTS & PROCESSES

A New Wear-Resistant Hi-Temperature Tooling Material, Grade M120F-T ceramic used in alloying semiconductor materials, is described in a technical data sheet. Bulletin lists advantages of this type of ceramic and includes specifications and fabrication information. Get Bulletin 117 from Duramic Products, Inc., 262-72 Mott St., New York 12, or Circle No. E1.

Two Nickel-Silver Wire Alloys introduced by Bridgeport Brass Co., 30 Grand St., Bridgeport 2, Conn., can be used in screws and rivets, slide fasteners, and optical parts. They have excellent cold working properties and are readily formed, bent, or cold headed. Company supplies details, or Circle Inform-A-Gram No. E2.

Twenty-Three New Sizes of extruded rectangles are now available from Ampco Metal, Inc., 1745 S. 38th St., Milwaukee 46. They're recommended for severe metal-to-metal wear applications, extremely heavy load and abnormally high abrasive conditions. For more information, write the company, or Circle Inform-A-Gram No. E3.

Grain Size of Brass Alloys is discussed in a bulletin which tells how selection of the right grain size can reduce user's finishing costs. Also tells how annealing and cold rolling affects grain size. Get a copy from Bridgeport Brass Co., 30 Grand St., Bridgeport 2, Conn., or Circle Inform-A-Gram No. E4.

A New Molybdenum and Molybdenum-Titanium Alloy pricing schedule is now available. The 22-page bulletin includes information on billets, sheets, forgings, ingots, plates, and rectangular and round bars. Write to Refractomet Div'n, Universal-Cyclops Steel Corp., Bridgeville, Pa., for a copy of Schedule No. 1, or Circle Inform-A-Gram No. E5.

"Martensitic Stainless Strip Steel" tells how these steels can be used in applications previously restricted to straight high carbon strip steels. Three types are described with information on analyses and heat treating. Write to Uddeholm Co. of America, 155 E. 44th St., New York 17, for your copy, or Circle Inform-A-Gram No. E6.

MAGNETIC SINE PLATES

COMPOUND AND SINGLE ANGLE

New Dual Field permanent Magnetic chucks with extra holding power. Positive lock on each axis.

Model No. 1905M

The new Dual Field permanent magnetic chucks, with a center T slot, allow either side to be magnetized independently. All models are accurate to .0002" in dimensions and parallelism. A .2000" recess is provided for small angles.

Write for catalogue and prices on full line of Bald Eagle Sine Bars and Plates.

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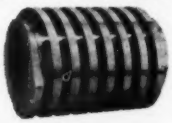
LEAD SCREWS
JACK SCREWS
ELEVATING SCREWS
WORMS OR SPECIAL FORMS



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We specialize in internal thread grinding from ⅝" I.D. to 13" I.D.

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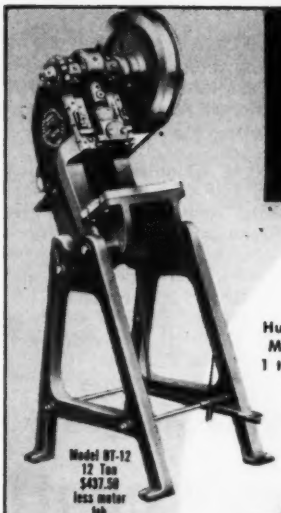

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1 to 12 ton Capacities

Moderate in Price

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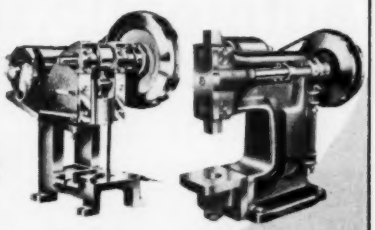

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CIRCLE INFORM-A-GRAM KEY NO. 874

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UNCONDITIONALLY GUARANTEED

to out-perform any other style of carbide throw-away insert—for straight turning, boring, or facing applications—on any kind of material.

solid carbide

indexable insert

The pentagon is a cam ground, radii tangent, indexable insert of solid carbide. It presents 10 cutting edges at a 30° lead angle and each edge will produce more finished work than the edge of any other standard insert.

Not on tests alone—but in actual production; on various operations; machining all types of materials—Willey's Pentagon more than doubled the best performance of all other inserts tried. It is proven superior . . . we guarantee it.

Try the pentagon! You'll save money. You'll do a better job—faster, and once used you'll never go back to fragile . . . high-cost . . . yesterday's tooling.

A complete catalog of Willey's carbide tool products is available on request.

Send your part print and present tool layout for prompt quotation

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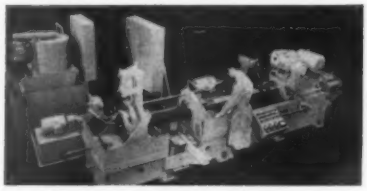
CIRCLE INFORM-A-GRAM KEY NO. 875

Grinding & Finishing

PROCESSES & PRODUCTS & PROCESSES & PRODUCTS & PROCESSES & PRODUCTS & PROCESSES & PRODUCTS

For Heavy or Rapid Stock Removal from large diameters and longer than average bores, use the new heavy-duty horizontal Microhoning machines. Model B-612 permits removal of 1.3 cu in of stock/ min. from hardened steel liners. Get details from Micromatic Hone Corp., 8100 Schoolcraft Ave., Detroit 38, or Circle Inform-A-Gram No. F1.

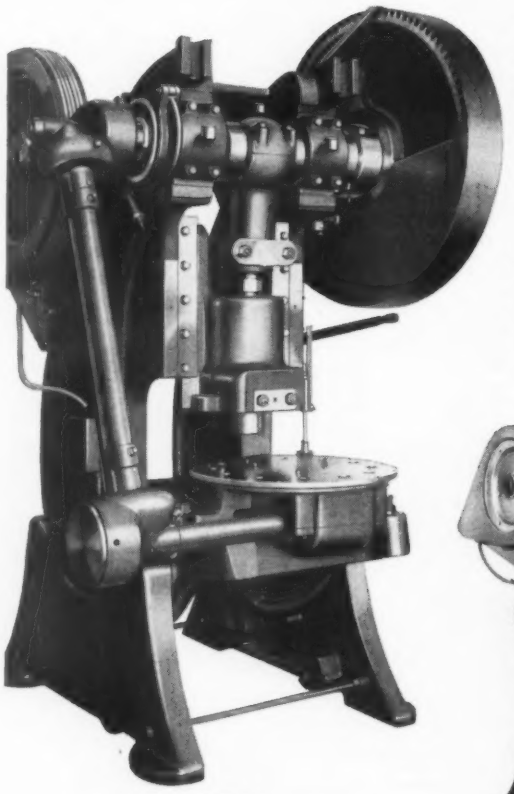


Three New Grinding Gages are featured in a 16-page catalog covering Arnold continuous grinding gages. Dimensions are given for a gage for continuously measuring inside diameters while grinding, and other measuring instruments. Get Catalog 59A from Federal Products Corp., 1144 Eddy St., Providence 1, R.I., or Circle No. F2.

Modern FEDERAL Dial Feeds give you

automation at less cost!

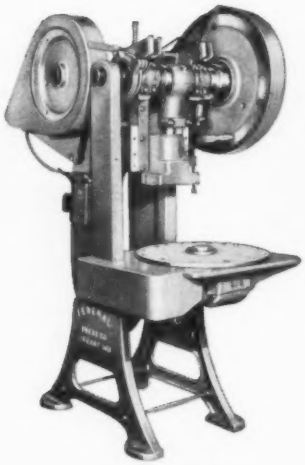
—eliminate specialized and more costly equipment!



Federal Dial Feeds are your answer to greater production at lower costs. Equipped with special jigging, automatic feeds and ejectors, their applications are virtually unlimited and the need for specialized, more costly equipment often eliminated. (Example, one manufacturer increased production 600%.)

Add Federal's quality features and workmanship... and you've got a winner. Investigate Federal Dial Feeds for your operations. Gear or chain driven with cam-type indexing mechanisms. Sizes range from 6 to 80 tons.

No. 7 Dial Feed
Gear Driven. Capacity, 80 tons.



No. 3 Dial Feed
Chain Driven. Capacity, 26 tons.

FEDERAL PRESS COMPANY
907 Division St., Elkhart, Indiana

FEDERAL DIAL FEED PRESSES
33 Years' Experience in Dial Feed Engineering and Construction

CIRCLE INFORM-A-GRAM KEY NO. 88

A Precision Diamond Dressing Tool Concept is introduced in a folder that describes this method of orienting diamonds in holders to increase life and reduce maintenance and replacement costs. Basic dressing tool types are outlined. Permattach Diamond Tool Co., Inc., Professional Bldg., Milford, N.H., supplies copies of the folder, or Circle Inform-A-Gram No. F3.

Cut Downtime in welding operations with a new raised hub disc-wheel for portable grinders. The wheel's two layer construction permits two different grinding angles so that grinding and finishing operations can be done without wheel change. Literature is available from Bay State Abrasive Products Co., Westboro, Mass., or Circle Inform-A-Gram No. F4.

Fluidmotion Wheel Dressers that dress two angles tangent to a radius in one continuous motion with 0.0001″ accuracy, are described in a folder. Contains diagrams and specifications of this line that dresses complex forms simply and accurately with fluid motion. Get a copy from J & S Tool Co., 87 Dorsa Ave., Livingston, N.J., or Circle Inform-A-Gram No. F5.

The Matco Sine Dresser is for use with standard gage blocks and sine table. The diamond holder block has 2″ travel and is moved across grinding wheel by a smooth screw feed

actuated by a hand knob. Dresses grinding wheel angles to within 0.0003″. Matco Div'n, Dept. 150, Manting Tool & Die Corp., Morley, Mich., or Circle Inform-A-Gram No. F6.

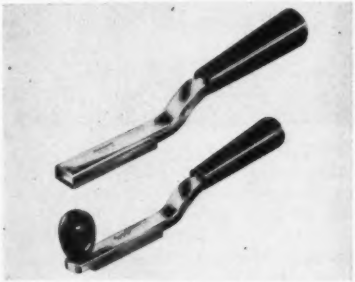
A Cylindrical Grinding and Indexing Attachment is described in a bulletin that explains and gives application data and detailed drawings of the unit. Model 616 can be used for dry grinding small cylindrical work, tapers, and work requiring indexing on surface grinders. Write for your copy to Henry Owens & Co., Inc., 51 Washington Ave., Cranston 7, R.I., or Circle No. F7.

Grinding & Finishing

A New Bag Type Dust Collector has been announced by The Cincinnati Electrical Tool Co., 360 Mt. Hope Ave., Cincinnati 4. Type AIR-4 is designed for service with up to

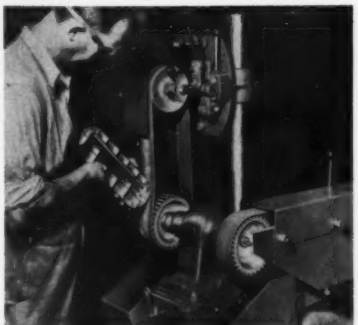
two 30″ grinding wheels or two 18″ buffing wheels, and is powered by a heavy-duty drip-proof 3-hp motor. Get data from the company, or Circle Inform-A-Gram No. F8.

A New Carbide Hand File Series has been added to the line of Severance Tool Industries Inc., 730 Iowa St., Saginaw, Mich. It features an offset handle and comes in a range



of five cuts from fine to coarse to handle even hard abrasive materials. Bulletin 2-CHF is available from the company, or Circle Inform-A-Gram No. F9.

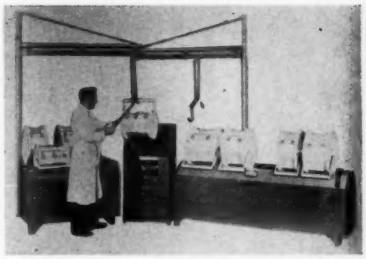
A Line of Versatile, Low-Cost 2½″ Belt Grinders do fast, efficient grinding, buffing, and deburring. When used instead of wheel grinders they eliminate set-up wheels and wheel



dressing. For details write Rockwell Mfg. Co., Walker-Turner Div'n, Dept. 1007, 400 N. Lexington Ave., Pittsburgh 8, or Circle Inform-A-Gram No. F10.

A Honing Machine line now has a working range of from 0.100″ to 2.625″ hole diameters with tooling available from stock, and to 4½″ with tooling built to order. A revised Bulletin X-MAN-5000 1 is available from Sunnen Products Co., Dept. D-43, 7910 Manchester Ave., St. Louis 17, or Circle Inform-A-Gram No. F11.

An Inexpensive, Precision Deburring and Finishing System called Roll Barrels reduce parts production time, and cost. Ideal for processing a variety of parts in small or large lots. Using two machines, one operator can continuously process up to 12 different barrels of parts at the same time. ALMCO, Queen Products Div'n, King-Seeley Corp., Albert Lea, Minn., or Circle Inform-A-Gram No. F12.



PUSH BUTTON *Speed Selection*

from **to** **in seconds**

or to *any* intermediate speed, *instantly*

Just push a button and watch the large tachometer dial on the headstock!

It's that easy!

The work is done by a motor driven speed changer. It accelerates or slows the lathe to any desired speed in seconds. With a 10:1 ratio, this new variable drive makes it easy to select from a wide range of speeds—200 to 2000 rpm in direct drive and 40 to 300 rpm in back gear.

Maximum stability and smooth power transmission are assured because the drive unit is oversized. All pulleys and shafts are fully supported (eight bearings). Double V-belts throughout the drive eliminate slippage and deliver full power to the spindle. Because of this rigidity and extra pulling power, this lathe will take heavy cuts at all speeds and precision finish cuts at high speeds.

It is a precision lathe, moderate in price, with the versatility for toolroom, production or second operation jobs.

SHELDON *Variable Speed* **PRECISION LATHES**

Illustrated WM56P 13″ Swing- 34″ Centers Base Price F.O.B. Factory **$2146.00** Less Chip Pan and Electricals Also available with 11″ Swing

Write for

"Variable Speed" Circular and General Catalog showing . . .

- 10″, 11″, 13″ and 15″ SHELDON Precision Lathes (Bench, Pedestal and Cabinet types)
- 13″ and 15″ SEBASTIAN Geared Head Lathes
- SHELDON Milling Machines
- SHELDON Back Geared Shapers

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CIRCLE INFORM-A-GRAM KEY NO. 89

IF
YOU MAKE
TEMPLATES...
you'll want
PEM
DRILL BUSHINGS

For these Time, Labor, Money-Saving Features

One hole, compression-mounting, utilizing the squeezing action of any standard press, locks these self-clinching bushings into template metal in one operation.

No riveting, no welding, no indexing, no nesting, no outboard supports, no chance of "cocking" during installation.

High torque and push-out resistance. Flush surface on reverse side of template. Permit thin-gauge, light-weight templates.

Save their cost plus a profit by simplifying template production.

Write for literature and sample.

PEM
PENN ENGINEERING & MANUFACTURING CORP.
DOYLESTOWN, PENNSYLVANIA

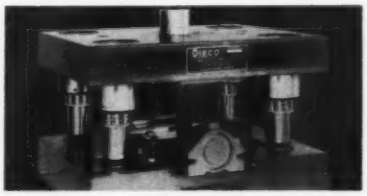
CIRCLE INFORM-A-GRAM KEY NO. 901

Toolroom

PROCESSES & PRODUCTS & PROCESSES & PRODUCTS & PROCESSES & PRODUCTS

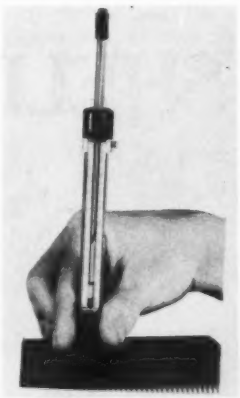
A 416-Page Precision Instrument Components Catalog lists over 10,000 items. A precision tool components section lists clamps, washers, screws, and studs. Dimensional drawings are given for typical applications. Write PIC Design Corp., 477 Atlantic Ave., E. Rockaway, L.I., N.Y., or Circle Inform-A-Gram No. G1.

A New Ball Bearing Die Set assures positive punch and die alignment, eliminating burred parts, reducing rejects, and extending the

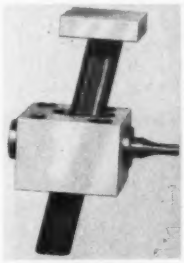


life of dies between regrinds. It's easy to assemble and disassemble, thus reducing die building and changeover time. E. W. Bliss Co., Die Supply Div'n, 1400 Brookpark Rd., Cleveland, or Circle Inform-A-Gram No. G2.

All Hi-Lo Clamp Starter Set Components are shown in a brochure which also illustrates how the adjustable clamps are used to secure workpieces on bolster plates and machine tool tables. Write Hi-Low Products Co., Steel City Testing Machines, Inc., 8817 Lyndon Ave., Detroit 38, for Brochure 858, or Circle No. G3.

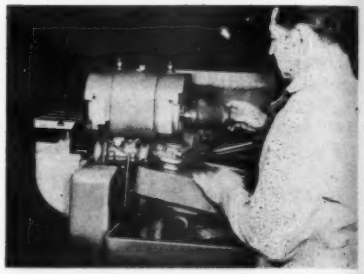


New Ingersoll Semi-Automatic Cutter Grinders are now available. They may be obtained either as a complete unit or by having power control parts added to recent manually-actuated Ingersoll cutter grinders. These grinders reduce labor costs and provide better grinds. They add advantages of power-controlled grinding to the advantages of the



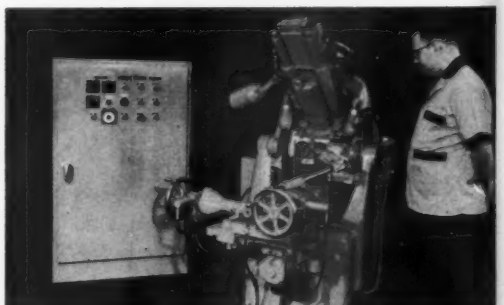
For Building Cam Dies use the Octocam, that's designed for economical side piercing operations. It's made of hardened and precision ground steel for long performance. Dowel holes are honed to fit standard 5/16" dowels. Barrel travels 3/16" per in of press stroke. Bulletin available from Octavia Tool & Gage Co., 3320 N. Kedzie Ave., Chicago 18, or Circle No. G4.

A New Tool Sharpening Machine, with automatic reciprocation, assures uniform and repetitive tool tip accuracy and permits one operator to attend several machines at once.



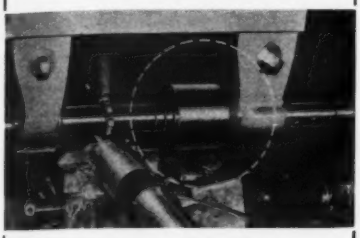
Model 3 is for conventional elliptical-tip Carbide or HSS tool grinding, and Model 4 is for either elliptical or true radius types. The Heald Machine Co., 8 New Bond St., Worcester 6, Mass., or Circle Inform-A-Gram No. G5.

The Sklero Portable Hardness Tester, operating on the rebound principle, provides consistently accurate readings to within 1.0 Rockwell C. Instrument is placed in vertical position on article to be tested. The rebounding bar, which carries a hardened steel ball point, when raised and released rebounds to a point corresponding to the hardness of the object and is locked into position for reading. Get data from Precise Products Corp., Racine, Wis., or Circle Inform-A-Gram No. G6.



30" Ingersoll general purpose grinder. Write The Ingersoll Milling Machine Co., Rockford, Ill., for details, or Circle Inform-A-Gram No. G7.

ELIMINATE MILLING MACHINE MAINTENANCE



UPS FEEDS AND SPEEDS 200%

See how General Electric, Jeffrey Mfg., hundreds of others absolutely end arbor bushing maintenance problems and decrease production costs on horizontal milling machines by replacing the bronze outer support bushing with a Jergens "Live" Sealed Roller Bearing Unit. Jergens Units with adjustable roller bearings hold precision—permit increases in milling speeds and feeds to take full advantage of carbide cutters. The rigidity of these units increase cutter life and eliminate chatter, frozen bushings, and twisted arbors. See how hundreds save thousands! Write for FREE case histories of actual company performance reports of jobs and dollars saved.

DONLEY PRODUCTS, INC

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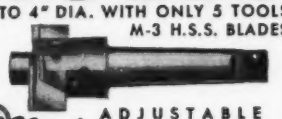
1" TO 4" DIA. WITH ONLY 5 TOOLS
M-3 H.S.S. BLADES



Clark ADJUSTABLE COUNTERBORES

P.O. BOX 990 BEVERLY HILLS, CALIFORNIA

CIRCLE INFORM-A-GRAM KEY NO. 912

MAGNIFIES the "hard to read" vernier scales on calipers and height gages. No more eye strain, guess work or hit or miss setting and reading. LENS is finest quality optical glass, specially designed and ground for the purpose with utmost optical skill. 4X magnification shows lines true and correct. In daily use in plants of Westinghouse, General Electric, General Motors, Chrysler, Packard, Ford, Boeing Aircraft, Bendix Aviation and many others engaged in defense work.

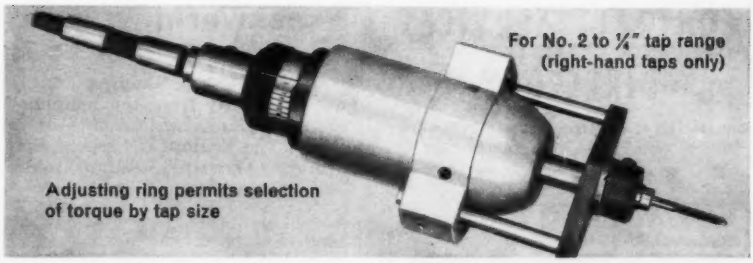
Made in 3 sizes to fit Starrett, Brown & Sharpe, Lufkin Tools, and others of similar design. S No. 100 for 6" Vernier Calipers; S No. 200 for 10"-12" Height Gages, also 10"-18"-24" Vernier Calipers; S No 300 for most popular type 18" and 24" Height Gages and for 36"-48" 60" and 72" Calipers.

For Complete Information Write, Phone or Wire

STEBAR COMPANY

215-221 23th Ave. North Minneapolis 11, Minn.

CIRCLE INFORM-A-GRAM KEY NO. 913



reversible overrolling tap driver ups tool life

For the first time, heat-producing friction and impacting have been eliminated in a releasing driver for taps. It's the Scully-Jones reversible "Safe-Torque" tap driver, with overrolling clutch—a new tool that gives you reliable, precise control over torque. It releases instantly and completely below the break strength of a tap. Preset torque remains constant because all contacting driving members roll on each other.

Production is increased because the operator gains confidence—there's no slow-down for blind holes, no noise, vibration, or impacting. Accuracy goes up, too. Tension spring permits tap to float in and out of hole, following its own lead without distorting threads. The driver starts releasing when the tap gets dull. This prevents cutting undersized threads.

Adjustable depth stop controls number of threads and tap depth when required. Simple gear-type reversing mechanism withdraws tap without changing spindle rotation. Contact your Scully-Jones representative or distributor, or call us: BIshop 7-5900.

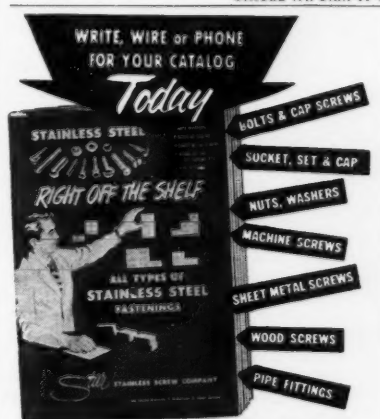
Scully-Jones and Company

1913 So. Rockwell Street, Chicago 8, Illinois

Tension-and-compression type—three sizes, No. 10 to ¼" tap range
Standard type—five sizes, No. 10 to 1½" tap range
Quick-change type—three sizes, No. 10 to 1" tap range

SCULLY JONES **SAFE-TORQUE TAP DRIVERS**

CIRCLE INFORM-A-GRAM KEY NO. 914



Star Stainless screws have clean—bright and shiny—heads

STAR STAINLESS SCREW CO.

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CORROSION RESISTANT

CIRCLE INFORM-A-GRAM KEY NO. 915

New **RADITURN** √

CUTS ANY RADIUS

Convex, Concave or Ball

Patented

The accurate short cut for turning any radius. Adaptable to most any lathe. Contact your tool supplier or write for details.

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1436 East 47th St., Cleveland, Ohio. Founded in 1908. Builders of Special Machinery. General Machine Work.

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— Except Screw Machine Cams —
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Design Assistance Offered
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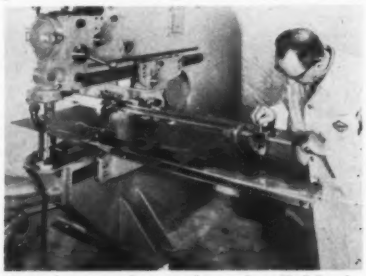
Pressworking

PROCESSES & PRODUCTS & PROCESSES & PRODUCTS & PROCESSES & PRODUCTS & PROCESSES & PRODUCTS

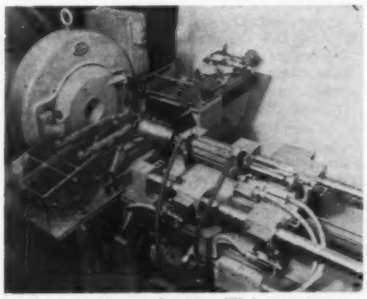
A New Copy Nibbling Machine works directly from the template to produce blanks or cut-outs of any shape. The Trumpf CN machine also performs shearing, beading, folding,



flanging, and peening. Available in 41″, 49″, and 59″ throat depths. Cosa Corp., 405 Lexington Ave., New York 17, N.Y., or Circle Inform-A-gram No. H1.

Concentric Punches are available in stock sizes with tolerances as low as 0.0002″. These punches are ideal for gang operations as well as individual use. Get a catalog from Ward Machinery Co., 564 Washington St., Chicago, or Circle Inform-A-Gram No. H2.

A New Automatic Feeder and Unloading Accessory for swaging machines provides almost automatic swaging. Operator places workpieces on a feeding rack and the swaging



is done automatically. This accessory assures accurate work alignment, positive production control, and greater capacity. The Fenn Mfg. Co., Newington, Conn., or Circle Inform-A-Gram No. H3.

A New Durant Roll Feeds Catalog gives specifications and prices for 15 standard models and their accessories. Advantages and special features are discussed. Write to Durant Tool Co., Providence 5, R. I., for a copy of this catalog, or Circle Inform-A-Gram No. H4.

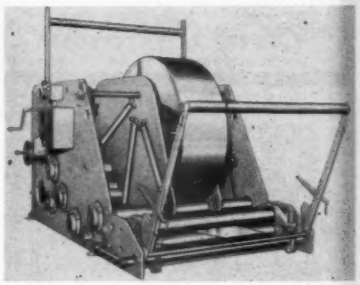
Special Air and Hydraulic Machines manufactured by the Logansport Machine Co., Inc., Logansport, Ind., are covered in a bulletin. These machines can be built to press, burnish, assemble, form, position, and shear. Write to the company for Bulletin 7-A, or Circle Inform-A-Gram No. H5.

A Microbar Gaging Assembly and new toggle switch control mechanism increase the convenience and efficiency of Wales-Strippit Fabricator punch presses. Mounted on the pantographic duplicator attachment of

the Fabricator press, it can produce templates or single production pieces to extremely close tolerances. A General Catalog is available from Wales-Strippit, Inc., 212 S. Buell Rd., Akron, N.Y., or Circle Inform-A-Gram No. H6.

"Feed Profit into Any Press Operation" describes the Dickerman Rol-Di-Feed press feeder, a completely self-contained cam-operated unit and requires no connection to crankshaft of press. Operating principals, features, and illustrations of typical applications are included. Get a copy from H. E. Dickerman Mfg. Co., 321 Albany St., Springfield, Mass., or Circle No. H7.

Greater Operating Convenience, increased strength and rigidity of frame, and improved efficiency are features of the new heavy-duty Koil Kradle design. The 700 Series handles coils weighing up to 20,000 lbs,



and widths to 50″. Get information from Benchmaster Mfg. Co., 1835 W. Rosecrans Ave., Gardena, Calif., or Circle Inform-A-Gram No. H8.

Light and Medium Cutting, punching, and flanging operations can be performed by the Minster Series 20 deep throat punching presses described in an illustrated bulletin. Construction and operating features and full specifications for 15-, 25-, and 35-ton models are also given. Bulletin 13, is supplied by The Minster Machine Co., Minster, Ohio, or Circle Inform-A-Gram No. H9.

BURR-BIT CUTS TAPPING COST WAY-DOWN!

Just lock Burr-Bit on any make tap and holes are deburred automatically, leaving a smooth clean chamfer. ONE OPERATION, ONE SETUP, ONE HANDLING.

NEW ADDITION
Now Burr-Bit fits 3 fluted taps from #6 to ½". Also available to fit any tap 2 or 4 fluted from #2 to ¾".

A quality product made of the finest high speed tool steel for use on almost every material.

WRITE now for complete data and reports from engineers who have adapted Burr-Bit and saved on their tapping operations.
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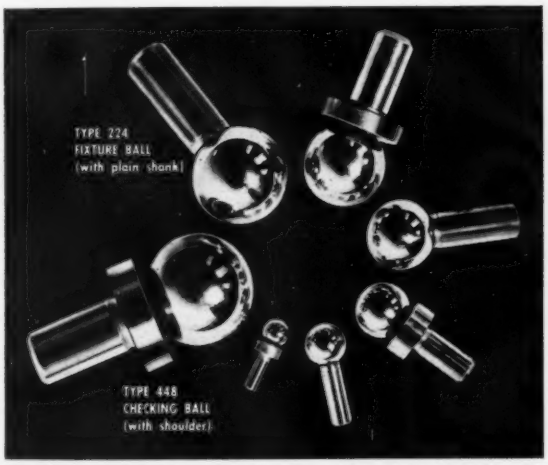

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- Durable; corrosion-resistant. Made of Type 440-C stainless steel, hardened to 55-58 Rockwell C.
- Highly accurate. Ball size held to ±.0001" for fixture balls; ±.00002" for checking balls.
- In stock: Types 224 and 448 in 7 ball sizes, ¼" to 1" by ⅛" steps; Type 348, with ½" ball and shouldered shank tapped 6-32. Other sizes to order.

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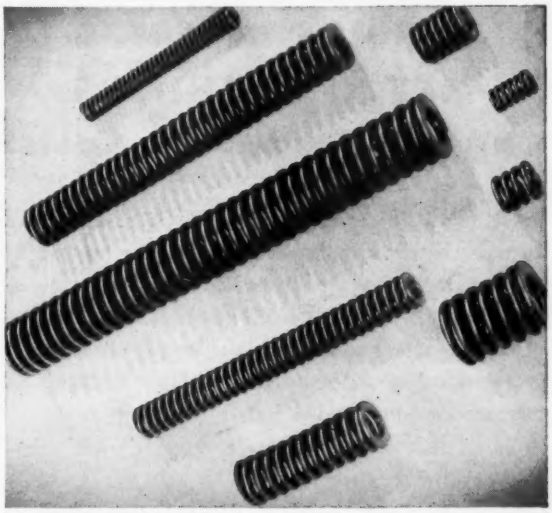

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Chrome vanadium die springs in stock in a wide variety of hole and rod sizes, lengths and deflections. Medium, medium-heavy, heavy duty for increased life and reduced down time. Write for list of specifications and prices, and name of nearest distributor.

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Corry, Pennsylvania

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Any speed from 50 to 11,000 fpm with this Vastly Superior NEW BAND SAW by

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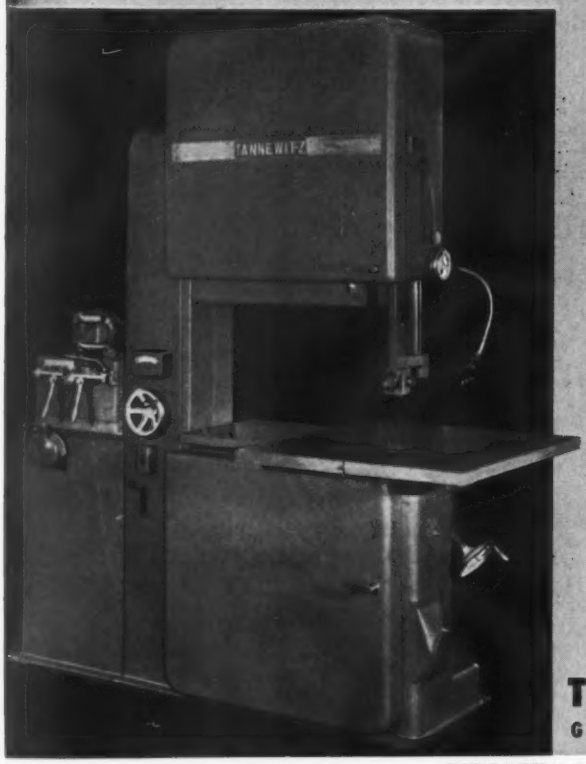

Ideal for tool room sawing, trimming castings or friction sawing steel and other metals formed or flat . . . the most versatile, efficient and best built machine in the field. Note these new features:

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6. **AUTOMATIC HYDRAULIC AUTOMOBILE BRAKES ON ALL MODELS.**

These and dozens of other features that make it the greatest time and money saving metal cutting machine on the market. Write or phone for complete details.

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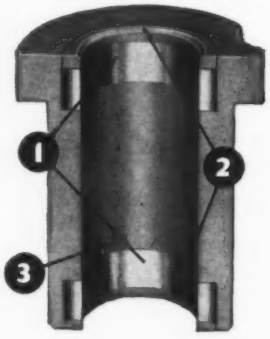
CARBIDE INSERTED MEYCO BUSHINGS Can Cut Production Costs!

MEYCO carbide inserted drill jig bushings have been successfully saving money on production runs for the past decade. Performance: same as solid carbide, but need not be handled with kid gloves. Greater economy, because of long life at less cost. You can enjoy the advantages of greater accuracy for a longer time, less spoilage, less machine down-time, added drill and jig life with MEYCO carbide inserted drill jig bushings. Get the full story now: write for new Bushing Catalog No. 41



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1. Tungsten carbide rings at the points of wear; 2. Steel rings protect drills and carbide; 3. Special hardened alloy steel body.

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POWER

...FOR LARGE HOLE TAPPING!

1. Extra 17 tooth spline drive for extra power
2. Double cone friction clutch for sensitive finger tip control
3. Helical gear means smoother operation under heavy strains
4. Exclusive "Tru-Grip" tap holder for "close-to-wall" work

The New Procunier Tap King represents a major advancement in large hole tapping units. Powerful, dependable, it can tap in steel up to 1¼" thick—and hold a class 2 fit with ease! It combines heavy duty ruggedness with delicate precision, to give you the best all 'round BIG tapper for BIG jobs! Operators like its super-sensitive action—management appreciates the many cost-saving features—including longer tap life, consistently uniform threads, fewer spoiled pieces. It always turns out more, higher quality work in less time, with less effort. Where cost counts and precision is paramount—the TAP KING is the tapper for you!

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Get the whole story on this remarkable unit. See the amazing production records that are being continually repeated in plants of every size, everywhere. Also details in the new Lead Screw Unit.

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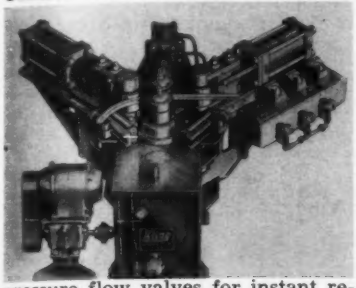
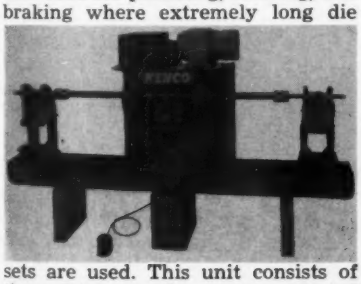
Eliminate 90% of the Flat Ends in angle bending with the new horizontal hydraulic double pinch-type angle and structural bending roll. Control levers actuate leak-proof



pressure flow valves for instant response and sensitive control of rolling operation. Catalog published by Kling Bros. Engineering Works, 1320-32 N. Kostner Ave., Chicago 51, or Circle No. H10.

New Lines of Punches and Die Buttons, Bal-Lok punches and dies, electrocoated piercing punches, and head type Bal-Lok formed punches and dies are illustrated and discussed in a new catalog. Dimensional diagrams and specifications are given for these and other items. Get Catalog 200 from Porter Precision Products, P. O. Box 208, Cincinnati 15, or Circle No. H11.

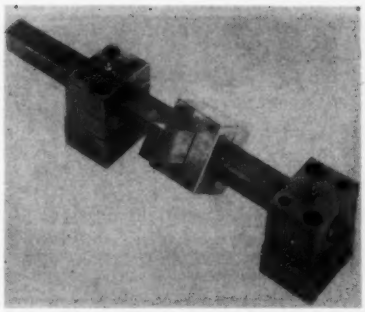
Exceptionally Long Progressive Die Work can be handled on the new Kenco Mark III-5E punch press. It's also used for punching, forming, and braking where extremely long die



sets are used. This unit consists of three 5-ton punch presses mounted on a rugged frame. Get details from Kenco Mfg. Co., 5211 Telegraph Rd., Los Angeles 22, or Circle No. H12.

A Double-Crank Press Bulletin covers the Warco line of straight-side double-crank presses, and illustrates and describes this line, available in 60- to 400-ton capacities. Obtain your copy from The Federal Machine & Welder Co., Warren, Ohio, or Circle No. H13.

Both Solid and Split Pillow Blocks for square shafts used in die automation are now furnished with replaceable bronze bushings. Bearing design compensates for usual wear due to rocking and the bushing is lubricated with standard grease fitting or with fittings for lube lines.



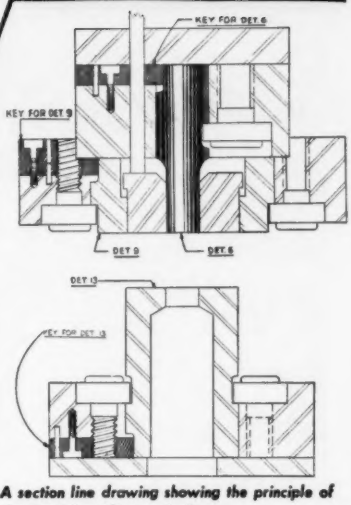
Get details from Jolico Industries, 6345 Balfour Ave., Allen Park, 10, Mich., or Circle No. H14.

NEW
HOVIS KEY-ALIGNED DIE
THE LATEST ADDITION TO OUR STANDARD UNITS

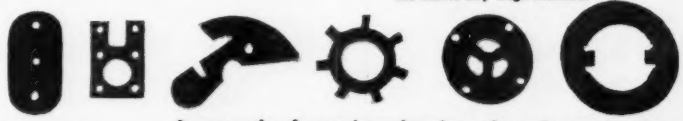
a must for irregular stampings

ELIMINATES ALL SET-UP ERRORS AND INSURES UNINTERRUPTED ACCURACY

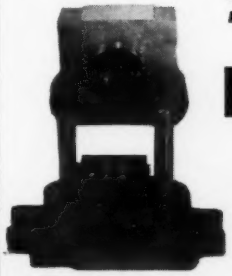
When producing irregular shaped stampings, it is important that the cutting members of the die are located in the proper radial alignment. Hovis has introduced the key-aligned die to meet this requirement . . . With the key-aligned die any press operator can install the inserts without the possibility of misalignment. This is accomplished with a flat on the insert which locates against a key in the retainer.



A section line drawing showing the principle of the Hovis key-align method.



An example of some irregular pieces these dies produce by merely purchasing special sets of parts on which we are glad to quote



Made in 6 sizes:
¾"-1½"-2½"-4"-6"-8"

HOVIS UNIVERSAL COMPOUND DIES

for producing WASHERS and SMALL STAMPINGS . . . No need to make a NEW DIE for every STAMPED PART

By simply removing and replacing five, small, interchangeable inserts a new part may be produced . . . This method makes possible all production including irregularly shaped pieces and shallow draws.

HOVIS SCREWLOCK COMPANY
8100 E. NINE MILE ROAD • BOX 97 • WARREN, MICHIGAN
Phone: Slocum 7-4800 Suburb of Detroit
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HOLES
WITH PRECISION ADJUSTMENT
M-3 H.S.S. OR CARBIDE

Clark "FINISHING CUTTERS"
P. O. BOX 990 BEVERLY HILLS, CALIFORNIA
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MINIATURE DRILL BUSHINGS
Hole Sizes—No. 80 to 3/32"
O.D. 3/32" to 13/64"
Lengths ¼" to 3"
.0002 Tolerance on I.D.
O.D., and Concentricity
Specials to your specifications
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Self-Indexing HEXTURRET
Convert your lathes for turret work this quick, easy way. ENCO HEXTURRET gives you the *accuracy*, *rigidity* and *speed* you need to step up lathe production and cut "per piece" costs. Easy as mounting your lathe tailstock. Does both normal and heavy lathe and screw machine work, drilling, counter boring, counter sinking, spot facing, reaming, turning, boring, etc. Fit all lathes 9" to 16" swing.
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Assembly

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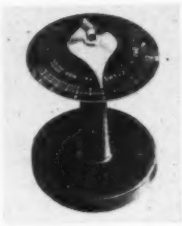


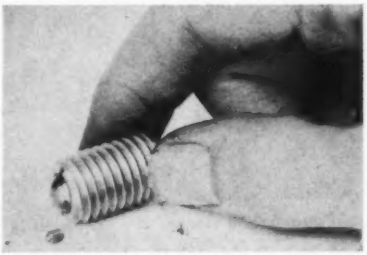
The Pedestal-Type Torque Tool Line has been expanded by Apco Mossberg Co., 1004 Lamb St., Attleboro, Mass. Work is applied directly to the tool which immediately indicates correct torque during assembly of electrical and instrumentation units. Measures torque from 0 to 0.3, 0.6, 0.8, or 1.0 of an in-oz. Write company for details, or Circle Inform-A-Gram No. J1.

A New Pistol Grip Electrode Holder with built in safety cut-out prevents accidental shocks because when grip is released, current goes off. Its tip grip on electrodes permits use of electrodes down to a

short stub for 15% savings in rods. Contact Frank Niemi Metal Products, Inc., Gurnee, Ill., for information, or Circle No. J2.

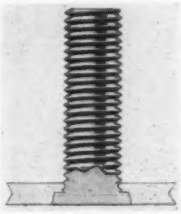
"The Importance of Filler Wire Surface Quality in High Strength Aluminum Welding" is available from The Dalwald Co. Inc., 11 Bertel Ave., Mt. Vernon, N.Y. Describes availabilities, sizes, tempers, and other data on aluminum welding wire. Get a copy from the company, or Circle No. J3.

Two New Miniature Sizes of ball plungers have been added to the line by Vlier Engineering Corp., 8900 Santa Monica Blvd., Los Angeles 46. Sizes 10-32 and 1/4-20 are



useful in instrumentation, electronics, and missile work where small sizes, light weight, and reliability are required. Get details from the company, or Circle Inform-A-Gram No. J4.

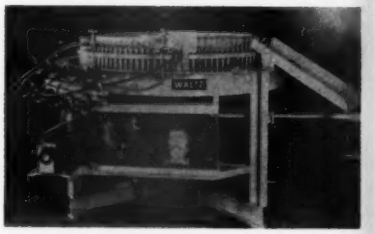
New Resistance Welding Alloy features high temperature ductility and resistance to annealing. Use Mallory 28 where improved resistance to annealing or softening is required and resistance where other alloys are apt to crack. For details write Metallurgical Div'n, P. R. Mallory & Co., Indianapolis 6, Ind., or Circle Inform-A-Gram No. J5.



A Captive Stud was designed for quick, easy, flush-head installation in panels of cold rolled steel, brass, copper, and aluminum alloys from 0.040". Featuring the self-clinching design, the studs are dropped into punched or drilled holes and squeezed into place by presses. Write Penn Engineering & Mfg. Corp., Doylestown, Pa., for details, Circle No. J6.

Blind Rivets are the subject of an 8-page brochure that gives advantages, technical information, recommended hole sizes, material specifications, shop practice notes, and shear and tension strengths values. Write for Brochure 8-409 available from Huck Mfg. Co., 2480 Bellevue Ave., Detroit 7, or Circle Inform-A-Gram No. J7.

This Continuous Brazing Machine produces 1000 pcs/hr and can be adjusted by varying rotating table's drive speed. Workpieces are positioned with one in each empty hold-



er as it comes around on the table through the flames from the torches. The Waltz Furnace Co., 1901 Symmes St., Dept. 26, Cincinnati 6, or Circle Inform-A-Gram No. J8.

New Type of Blind Rivet sets and seals in one step. The IMEX rivet is air and water tight at pressures as high as 500 psi and is resistant to vibration. To set, use standard tools and pull a mandrel into the rivet shank spreading and setting it. POP Rivet Div'n, United Shoe Machinery Corp., W. Medway, Mass., or Circle No. J9.

ELIMINATE WEAR ON YOUR COSTLY DIE SETS

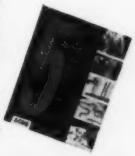
WITH INEXPENSIVE **ACRO** LEADER PIN OILERS

Pin oilers in place on die set.

These simple, inexpensive pin oilers fit over each leader pin and seal in place with a rubber neoprene washer. Each cup is filled with oil so each downward stroke brings bushing in contact with oil and upward stroke distributes oil evenly over leader pins. You'll eliminate bushing wear, leader pin scoring, and maintain die accuracy with these oilers.

Order today. Prices shown are F.O.B. Milwaukee.

Pin dia. ⅞", 1" or 1⅛"	Pr. $ 6.50
Pin dia. 1¼", 1½" or 1¾"	Pr. 8.00
Pin dia. 2"	Pr. 10.00
Pin dia. 2½"	Pr. 12.00
Pin dia. 3"	Pr. 14.00



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3387 E. Reservoir Ave., Milwaukee, Wis.

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HIGH FREQUENCY *Induction* HEATING

HARDENING
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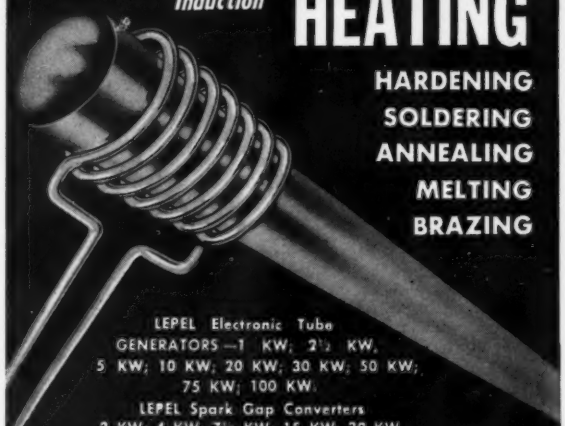

LEPEL Electronic Tube GENERATORS—1 KW; 2½ KW; 5 KW; 10 KW; 20 KW; 30 KW; 50 KW; 75 KW; 100 KW.

LEPEL Spark Gap Converters 2 KW; 4 KW; 7½ KW; 15 KW; 30 KW.

WRITE FOR THE NEW LEPEL CATALOG . . . 36 illustrated pages packed with valuable information.

All Lepel equipment is certified to comply with the requirements of the Federal Communications Commission.

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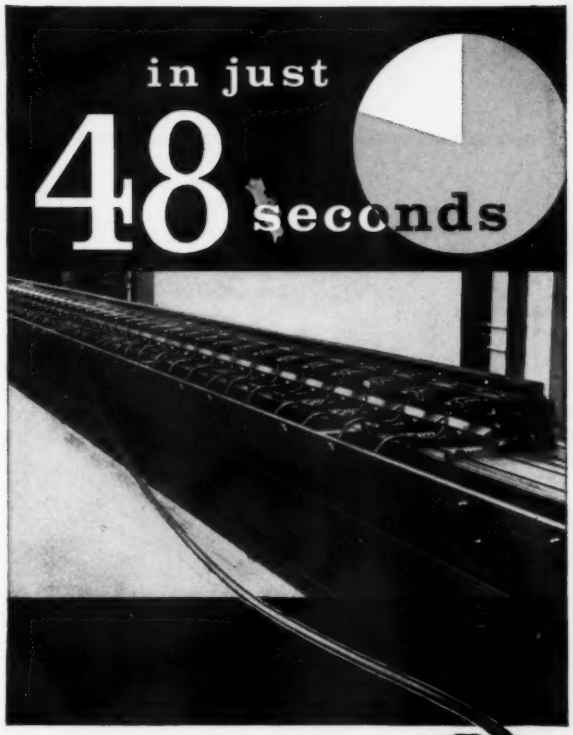
CIRCLE INFORM-A-GRAM KEY NO. 972

in just 48 seconds



THIS HAND clamps 96 cylinders from one source

It's a fact! This hand, with one pump activates 96 clamps simultaneously. The Newton Hydraulic Clamping System of pumps, cylinders and mounting parts provides ease of application . . . Cuts production time . . . And is moderate in cost.

Learn more about this universal clamping system. See your Newton distributor now or write for free catalogue, with full scale templates provided.

NEWTON NEWTON HYDRAULIC TOOLING COMPANY
AUBURN, MASSACHUSETTS, U.S.A.

CIRCLE INFORM-A-GRAM KEY NO. 973

REDUCE MARKING COST

WITH MODEL 465 HYDRAULIC MACHINE INSTALLED IN YOUR PRODUCTION LINE

Machine illustrated marks serial number, date code and part number identification on gear carriers at rate of 1200 per hour.

Parts are fed to machine from conveyor, marked and discharged to conveyor. . . . Head indexes automatically for serial numbering.

Our engineering services are available to assist you in improving your marking methods.

Write or call EAstgate 7-0300.

If It's Worth Making, It's Worth Marking.

WRITE FOR COMPLETE INFORMATION

GEO. T. SCHMIDT, INC.
4112 Ravenswood Avenue
Chicago 13, Illinois

CIRCLE INFORM-A-GRAM KEY NO. 981

Better Steel Think about Rule Dies!

Save up to 90%

FOR SHEARING, BLANKING, PUNCHING, PIERCING

YOU CAN MAKE STEEL RULE DIES FASTER, BETTER, CHEAPER WITH *RICHARDS* STEEL RULE DIE-MAKING EQUIPMENT!

Build steel rule dies in your own plant! Production cost and waiting time go down when Richards Equipment goes to work for you! More and more progressive manufacturers are turning to steel rule dies for faster, higher-profit work on all types and gauges of metal.

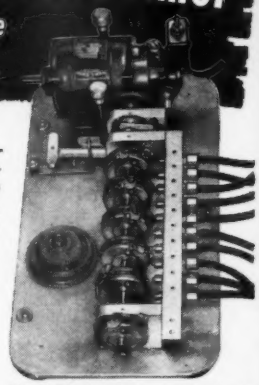
Richards' fifty years of experience as pioneer manufacturers of steel rule die-making equipment and supplies provides you with a complete service.

J.A. Richards Company

NORTH PITCHER STREET • KALAMAZOO, MICHIGAN

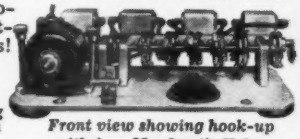
CIRCLE INFORM-A-GRAM KEY NO. 982

THIS CLEVER, DEPENDABLE
Electro-Pneumatic Timer
Controls Intricate Work Cycles . . .



This simple but astonishingly ingenious unit distributes air pressure to air-operated cylinders, presses, hammers, work feeders, clamping fixtures, chip blowers, work ejectors . . . each independent as to start, duration and end of cycle. Simply connect up 6, 12 or more cylinders in numerous sequences from 2½ to 33½ seconds. *You need this inexpensive* Mead Electro-Pneumatic Timer for cost-saving automation jobs!

No. 6 Electro-Pneumatic Timer



Front view showing hook-up with four Meadmatic Valves

Write Factory or Nearest Mead Representative For Bulletin 0000
Write for our cost-saving catalog. Or let the Mead Man show you.

(See Volume III Thomas' Register for nearest distributor's address, phone number.)

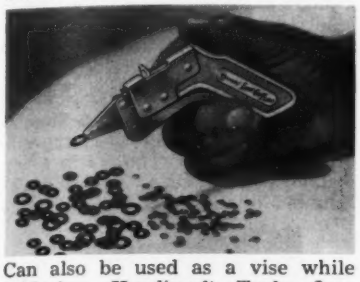
MEAD
SPECIALTIES COMPANY
4114 N. Knox Ave., Dept. HA-79, Chicago 41, Ill.

PATHFINDER IN AIR POWER AUTOMATION

CIRCLE INFORM-A-GRAM KEY NO. 983

Assembly

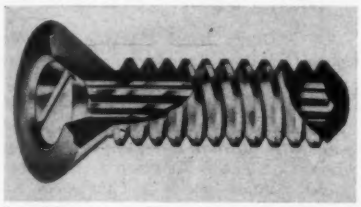
For Grasping and Positioning Small Objects use the Lock-GriPlier, featuring a locking arrangement that permits its jaws to take hold of small washers, brads, and screws.



Can also be used as a vise while soldering. Handicraft Tools, Inc., Div'n of X-acto, Inc., 48-21 Van Dam St., Long Island City 1, N.Y., or Circle Inform-A-Gram No. J10.

"Common Thread Fit Problems ... and their Symptoms and Detection" is a pocket-sized check list folder that lists seven common fit problems, noting possible causes next to each and gaging devices needed to detect them. Write for Form 2422 from Standard Pressed Steel Co., Box 600, Jenkintown, Pa., or Circle Inform-A-Gram No. J11.

A Composite Plastic Screw, featuring metal core, has insulating properties of plastic combined with strength of metal. This metal core carries the torque applied by driving means and eliminates danger of



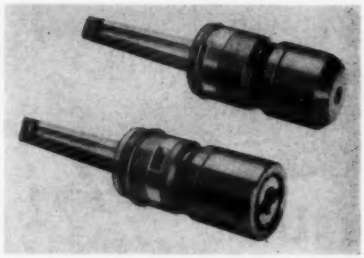
breaking or distorting the head. Technical brochure available from Austin Screw Products Co., 4873 W. Armitage Ave., Chicago 39, or Circle Inform-A-Gram No. J12.

This Newly-Designed Large-Size Impactool offers 25% more power and five times faster run-down. Size 834 has rated capacity of 1¼" bolt size, spins down nuts with free speed

of 3500 rpm, and delivers 850 powerful impacts/min. Ingersoll-Rand Co., 11 Broadway, New York 4, supplies bulletins on this and other Impactools, or Circle No. J13.

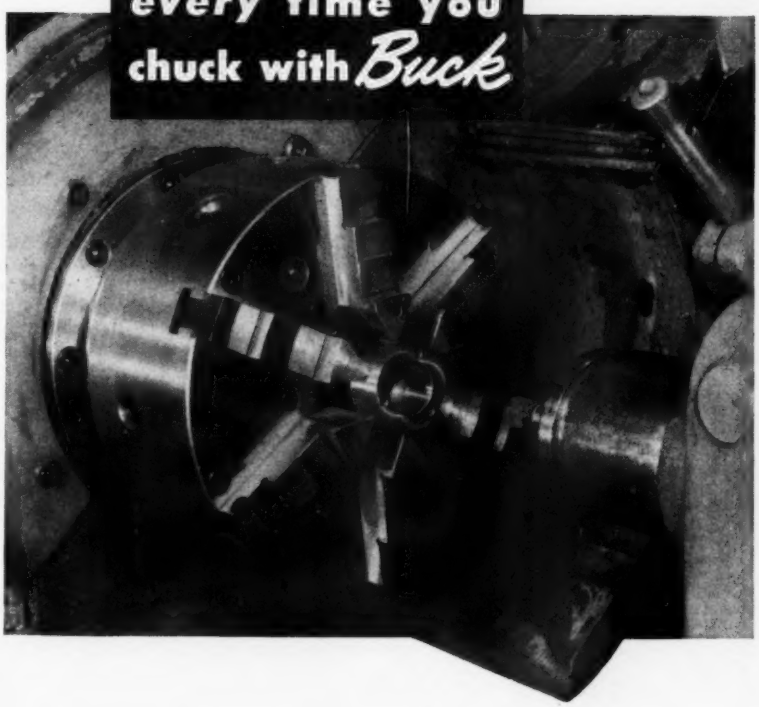
A 32-Page Socket Screw Products Catalog includes new specification and design standards. Unified screw thread tables, tables giving physical properties and dimensional standards, tables listing platings and finishing treatments, and the government specifications to which they conform are also given. Catalog 765 is published by The Bristol Co., Waterbury 20, or Circle Inform-A-Gram No. J14.

New Self-Opening Stud Driver has been added to the line of automatic and preset tooling manufactured by Scully-Jones and Co., 1901 S. Rockwell St., Chicago 8. Style M



(left) and B are offered for studs from ⅛" to ⅞" dia and 15/32" to 2-11/16" in heights of set stud. Write company for information, or Circle Inform-A-Gram No. J15.

YOU make money every time you chuck with *Buck*



1. You get *dead true* precision chucking single parts—.0005" precision on duplicate parts. (Conventional chucks are only accurate to .003" *when new.*)

2. You save costly machinists' time. Takes but a minute to indicate and adjust a Buck. No fooling around with shims.

3. The Buck Ajust-Tru® principle helps compensate for spindle run-out, compensates for chuck wear—greatly lengthens chuck life.

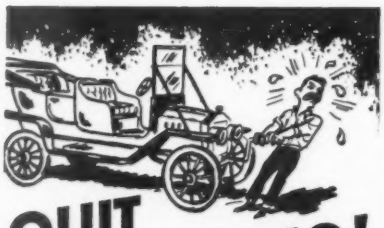
Buck Ajust-Tru 3- and 6-jaw chucks cost no more than conventional chucks. Send for catalog—see for yourself why "It pays to chuck with Buck."

Makers of Scroll, Power, Dust Proof, Independent Chucks.

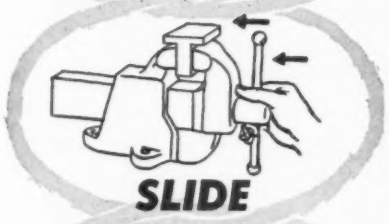
BUCK TOOL COMPANY

718 SCHIPPERS LANE • KALAMAZOO, MICH.

CIRCLE INFORM-A-GRAM KEY NO. 99



QUIT CRANKING!
... NEW model CARDINAL
SPEEDVISE
SLIDES!



production costs go down
production capacity goes up!

BUY CARDINAL

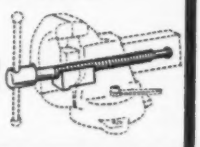
Modern plants require modern tools. The cost is quickly repaid in increased efficiency and time saved.

SIZES, 3½", 4", 4½" stationary or swivel base.

SOLD EVERYWHERE

FAST - SIMPLE
POSITIVE

Patented undercut thread of screw and nut assure positive locking.



SEND FOR OUR NEW CATALOG

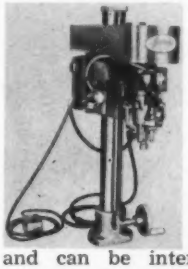
CARDINAL MACHINE CO.
1819 DANA ST., GLENDALE, CALIF.
CIRCLE INFORM-A-GRAM KEY NO. 1001

Machining

PROCESSES & PRODUCTS & PROCESSES & PRODUCTS & PROCESSES & PRODUCTS

A Line of Delta Industrial Metal Lathes are featured in a 20-page catalog. Specifications are given for the recently introduced 10" metal lathe which has variable-speed drive

and 3/4" collet capacity. Get your copy from Rockwell Mfg. Co., Delta Power Tool Div'n, 457 N. Lexington Ave., Pittsburgh 8, or Circle Inform-A-Gram No. K1.



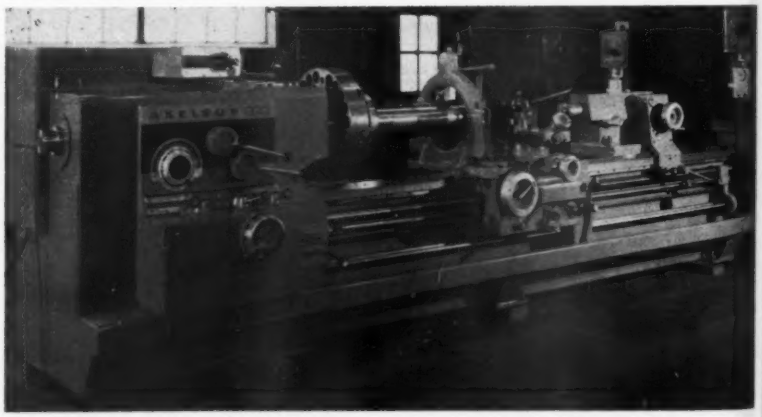
Use This Automatic, Adjustable Pitch Lead Screw Tapper on any drill press table. Unit comes in five models and has four speed pulleys. Tapping cycle is completely automatic and can be inter-connected with controls of an indexing table. Write Jarvis Corp., Middletown, Conn., for information, or Circle Inform-A-Gram No. K2.

New Heavy-Duty Drilling and Tapping Machines, featuring infinitely variable spindle speeds, are described in a bulletin. Model 4F's specifications, features, accessories, and spindle construction are discussed. Write to Edlund Machinery Co., Cortland, N.Y., for a copy, or Circle Inform-A-Gram No. K3.

Several New Styles and Sizes of heavy-duty ball and other types of end mills are incorporated in a new catalog. It classifies end mills by number of flutes for fast reference.

Get Catalog 59 from Arrow Tool & Reamer Co., 711 Stephenson Hwy., Troy, Mich., or Circle Inform-A-Gram No. K4.

A 92-Page Tool Catalog includes specifications for hobs, shaper and shaving cutters, master gears, broaches, and boring and forming tools. Installation requirements and drawings are included. Write to National Tool Co., 11200 Madison Ave., Cleveland 2, for a copy, or Circle No. K5.



Tougher, High Alloy Materials can be handled by the new Clearing-Axelson Blue Chip lathe, that features 50 hp motor, up to 2,000 rpm speeds, and 40 spindle speeds for greater versatility. This lathe, of welded steel fabrication, is designed according to the building block principle. The headstock, which contains the drive and operating controls, is built as a separate unit so it can be assembled to any size lathe bed. Clearing, division of U. S. Industries, Inc., 6499 W. 65th St., Chicago 38, or Circle Inform-A-Gram No. K6.

NOW A COMPLETE ENGINEERING AND DESIGN SERVICE — UNDER ONE ROOF!

- From Process Planning to Packaging
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GAGE COMPANY *Deep-Etch*
PRECISION PLASTIC • NON-BREAKABLE
COMPARATOR SCALES

Highly accurate and designed for making quick measurements at scale on projectors and comparators without any movement of machine or work.

Supplied on Gage Company Precision Plastic . . . a sturdy, non-breakable material of constant stability, .125 in thickness.

Unexcelled as a tool for use in drafting and engineering scale layouts for use on comparators.

Available in all standard magnifications and in several lengths. Various styles for all applications.

WRITE FOR BULLETIN NO. 58-70

GAGE COMPANY
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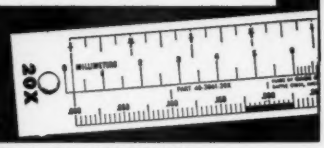
Battle Creek, Michigan



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SUPEREAM

REAMERS IN DECIMAL SIZES

470 REAMERS ARE CARRIED IN STOCK VARIATIONS OF .001

▼ Sizes from .032, .033, .034, .035, .036, etc., all the way up to .501. Any size required larger than .501 . . . blanks can be ground to your exacting specifications, delivered in 3 or 4 days. By purchasing SUPEREAM Reamers in steps of .001 you SAVE time, labor and money in the cost of extra machining and lapping.

▼ SUPEREAM Reamers all have ground and polished flutes and are held within .0002 tolerance. Reamers are also furnished in Right-hand spiral, Right-hand cut, as well as Left-hand spiral, Right-hand cut. These are delivered in 3 to 4 days.

Write for descriptive literature and prices

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FREE NEW-16 PAGE CATALOG
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LATCH BOLTS
CAST IRON HAND KNOBS
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QUARTER TURN SCREWS
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JIG FEET (3 TYPES)
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TEE NUTS
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CATALOG INCLUDES TRACING TEMPLATES

Northwestern NORTH WESTERN
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what price quality?

What is the lowest cost for dies that can turn out millions of precision-tolerance pieces without retooling?

We modestly suggest one way to be sure of having a valid answer: **include Cleveland Tool and Die Company when you ask for quotations on your next job.**

CTD **specializes** in precision dies. Has for 20 years. For applications ranging from home appliances to atomic reactors . . . from cigarette machines to satellites. More than just a catchword, precision is the basic concept on which our company was founded.

What price quality? Send your prints and specs for prompt quotations. Why not mail them today?

Incidentally, we've prepared a little brochure for your files, telling the CTD quality story, and listing our facilities. Write to . . .

George Banko
President

CLEVELAND TOOL & DIE CO.
1730 Eddy Road • Cleveland, Ohio

P. S. We also design and manufacture jigs, fixtures, gages, precision components and sub assemblies . . . and do custom grinding, boring and stamping. All to the highest quality standards.

CIRCLE INFORM-A-GRAM KEY NO. 1021

ONLY

THRIFTMASTER *Universal Joint Type* **DRILL HEADS**

have these exclusive* features

6 Standard Models

Models U-608 and U-1000—Ball Bearing.

Models U-620B and U-1012B—Plain Bearing. 11/16" or ½" min. centers.

Models U-608-BS and U-1000-BS—Ball Bearing Gear Case. Plain Spindles.

Semi-Standard Heavy Duty Full Ball Bearing

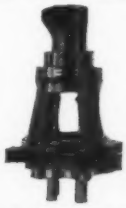
½" in Cast Iron—7⅛" or 9¾" Dia.

½" in Steel—7" or 9¾" Dia.

Also larger Adaptations and Full Line of Fixed Center Drill Heads.

• Standard Full Ball Bearing Construction including Spindles.

Driving assembly is FULL BALL BEARING mounted with 3 Bearings on each spindle. Thrust load carried by radial thrust bearings.



• Standard Slip-On and Slip-Off Template Construction.

For accurate setting and locating spindle brackets are machined to receive slip-on and slip-off template.

WRITE FOR FULL INFORMATION

THRIFTMASTER *Products Corporation*
A SUBSIDIARY OF THOMSON INDUSTRIES, INC.

Also Makers of DORMAN AUTOMATIC REVERSE TAPPERS

1012 N. Plum Street Lancaster, Penna.

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Fine tools that encourage Good Work

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If you don't know your local ARMSTRONG Distributor we will send you the name of those in your area.

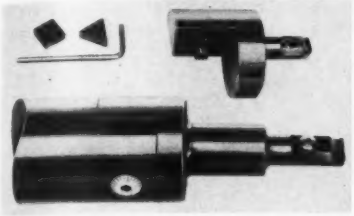
An ARMSTRONG Wrench feels right—is balanced. It goes over nuts or screw heads easily, grips firmly without sloppiness, won't round corners—because openings are carefully machined to correct sizes. It's safe, strong beyond need without clumsy bulk—because of superior design and selected steels, heat treated to proper degree of hardness and tensile strength. It's quality finished, ARMALOY (alloy steel) Wrenches in chrome plate with heads buffed; HI-TEN (carbon steel) Wrenches in baked-on gray enamel with heads ground bright . . . all plainly marked for size. All are uniformly excellent tools manufactured under strict quality control, by modern methods, with modern equipment in a modern tool plant . . . 1537 different industrial sizes and types—single wrenches, or sets in metal cases, boxes or rolls . . . each a quality tool. Armstrong Wrenches are "Fine tools that encourage good work."

ARMSTRONG BROS. TOOL CO. 5220 W. ARMSTRONG AVE. . CHICAGO 46, U.S.A.

CIRCLE INFORM-A-GRAM KEY NO. 1023

Machining

To Finish Small-Diameter Holes with throw-away inserts use the new adjustable boring bars developed by Wesson Co., 1220 Woodward Hts.



Blvd., Ferndale 20, Mich. Have interchangeable heads for boring holes from ½ to 1½″ dia and each head adjusts to cut up to a ½″ larger dia. Get details from the company, or Circle No. K7.

Eliminate Expensive Marring of Stock with Magnapads, for use on vise and lathe chuck jaws. They're made of soft metal that conforms to the contour of the stock and are held in place on the jaws by magnets. Available for use on 3″ to 5″ wide vise. Miller Pattern & Mfg. Co., 3320 Bay Rd., Saginaw, Mich., or Circle No. K8.

"Hi-Roc Carbide Drills for Hardened Steel" contains tips on the most effective methods of gaining high production and long tool life with these drills. Also lists drill specifications and other information necessary for proper tool selection and application. Get Bulletin 806 from M. A. Ford Mfg. Co., Inc., 1545 Rockingham Rd., Davenport, Iowa, or Circle No. K9.

A Cartridge-Type Spindle Plate construction is available on Thriftmaster universal joint drillheads for fast, easy removal of spindles, bearings, and related parts. With the removal of one lock screw, the cartridge can be removed from the

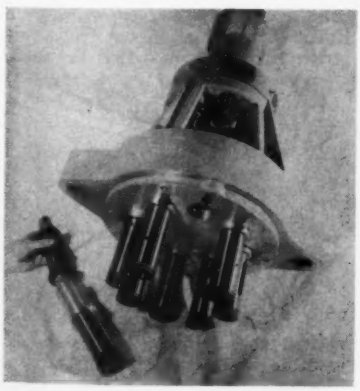
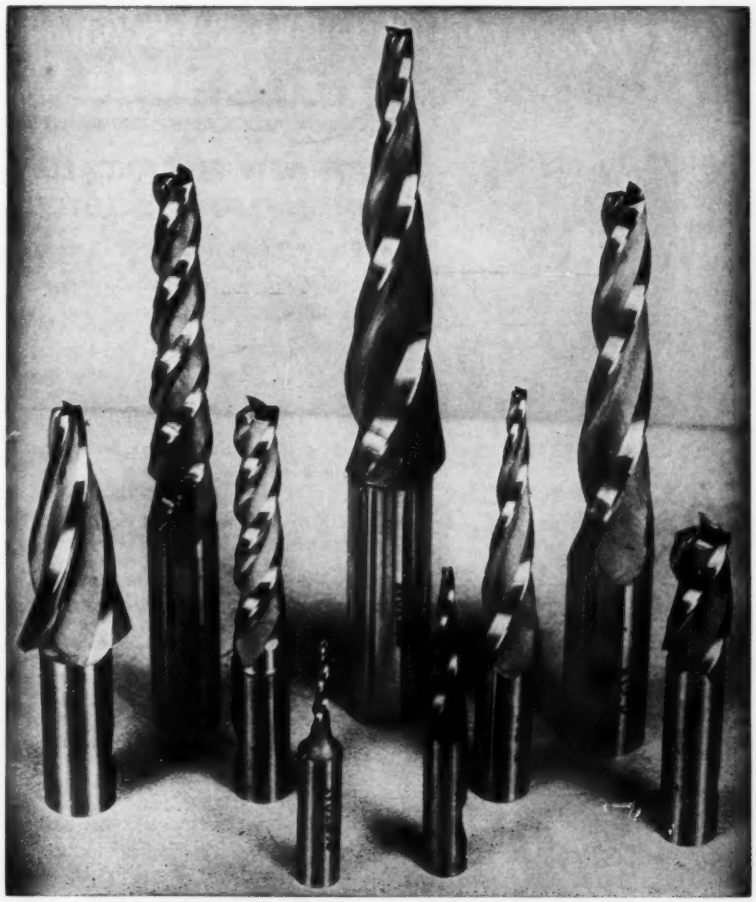


plate as a single unit. Thriftmaster Products Corp., 1012A N. Plum St., Lancaster, Pa., or Circle No. K10.



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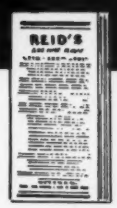
CONICAL TOOL CO. 3890 Buchanan S.W. Grand Rapids 8, Michigan

CIRCLE INFORM-A-GRAM KEY NO. 1031

Every TOOL ROOM NEEDS THIS BIG Free REID CATALOG



Big FREE 78 page catalog, listing scores of accessories and components needed in every tool room. All are top quality and low priced. Orders welcome for one or a thousand.

C. I. HAND WHEELS

DISHED STRAIGHT

Solid web and counter-balanced. Made of fine grain cast iron. Rims and handles are ground and polished to high lustre. Many sizes. Top quality and low prices.

CONTROL BALL HANDLES

Made of plastic in round type as shown and in oval and mushroom types. Choice of red or black in round or oval types. Also supplied in round polished steel. Available in many diameters and thread sizes. Top quality and low prices.

COMPRESSION SPRINGS

Assortment of many sizes ranging from 3/32″ to 1-1/2″ diameters. All springs 10″ long. Made from music wire. Extension spring assortment also available.

REID TOOL SUPPLY CO.
MUSKEGON HEIGHTS, MICHIGAN

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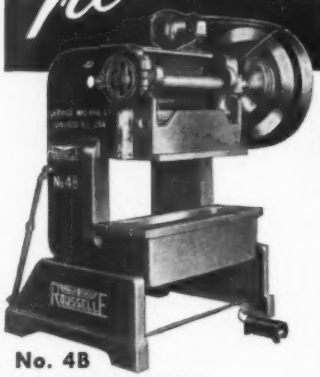
New 40-TON DOUBLE CRANK O.B.I.
ROUSSELLE



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- "Plug-in" foot and hand controls.
- Single stroke, continuous and jog selector.
- Low air consumption.
- Large die area.
- Roller bearing flywheel.
- Bronze main and crank bearings.

No. 4B
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CHOICE OF 30 SIZES AND TYPES IN 5 TO 40-TON PRESSES

SERVICE MACHINE CO.
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ROUSSELLE PRESSES ARE SOLD EXCLUSIVELY THROUGH LEADING MACHINERY DEALERS
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TRIED • PROVEN • GUARANTEED
MICRO MINIATURE END MILLS

2 Flute Flat End Single End
3 Flute Ball End Double End
4 Flute ⅛" Shank 3/16" Shank

Stub Length—1/32" Increments from 1/32" to 3/16"

Now 1/64" Increment Sizes in 2 Flute Single End type

When you think of small END MILLS —think of MICRO MINIATURES

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WOODSON TOOL CO. 4811 Lennox Blvd. Inglewood, Calif.

CIRCLE INFORM-A-GRAM KEY NO. 1042

DYKEM STEEL BLUE
Stops Losses making Dies and Templates

Popular package 8-oz. can fitted with Bakelite cap holding soft-hair brush for applying right at bench; metal surface ready for layout in a few minutes. The dark blue background makes the scribed lines show up in sharp relief, prevents metal glare. Increases efficiency and accuracy.

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2303L North 11th St. • St. Louis 6, Mo.

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BY A QUICK, EASY, INEXPENSIVE METHOD
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Wilmerding, Penna.

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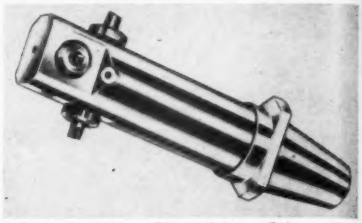
and
Large Precision Machining
Done to your specifications
We Have
22 Jig Borers
KIDDE PRECISION TOOL CORPORATION
10 Locust Ave., Roseland, N. J.

CIRCLE INFORM-A-GRAM KEY NO. 1045

Machining

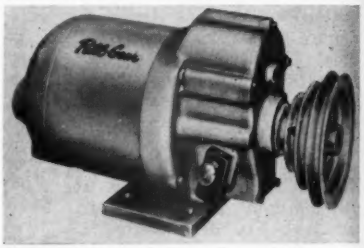
Double Boring Feeds without increasing the tool load with a boring bar double-feed cartridge. It has two or more diametrically opposed Sure-Bore cartridges and tool bits, each



micrometer adjustable. It's also adaptable as a floating reamer. Portage Double-Quick, Inc., 1046 Sweitzer Ave., Akron, Ohio, or Circle Inform-A-Gram No. K11.

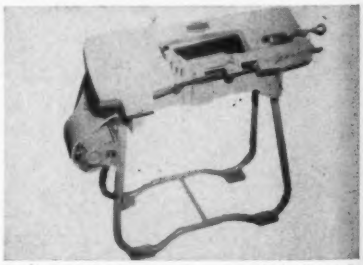
Code and Equivalent Sheets for carbide steel tools are now available from M. A. Ford Mfg. Co., Davenport, Iowa. Gives numbers and dimensions for solid carbide and high speed steel cutting tools and lists cut grades and fluting specifications. Write the company for your copy, or Circle No. K12.

Extend Machine Capacity to permit larger reaming, tapping, boring on normally light-duty machines using a speed reducer for drill presses, lathes, and boring mills. Features



finger-tip control and provides extra operating torque at reduced machine speeds. The Pull Gear Co., 25425 Mound Rd., Warren, Mich., or Circle Inform-A-Gram No. K13.

This 3" x 5" Power Metal Cutting Band Saw has adjustable hydraulic cutting feed control for infinitely variable blade feeds, and automatic shut-off switch that stops



motor when cut is completed. Adjustable vise permits angular setings up to 45°. Get Bulletin 159EX from Covel Mfg. Co., Benton Harbor, Mich., or Circle Inform-A-Gram No. K14.

He knows to a fractional "tenth" the exact hole size

To make precision holes he needs a precision gage

COMTORPLUG Expanding Internal Gage for holes ⅛" to 10" dia.

With EXACT GAGING KNOWLEDGE, you can

- eliminate rejects
- improve quality
- increase production

With COMTORPLUG, the operator not only knows hole diameter, but also detects front or back taper, ovality, barrel shape, etc. A fixed—not passing—reading. Automatic features assure uniform gaging free of operator influence. No air hose, no wires, no electronic gear.

REASONABLE IN COST

For holes ⅛" to 10" diameter

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Allison Div.	Falk Corp.	McDonnell Aircraft
Buick Motor Div.	Ford Motor Co.	National Lead
Century Electric Co.	General Electric Co.	Northrop Aircraft
Chicago Pneu. Tool	Hamilton Standard Division	Pontiac Motor Div.
Chrysler Corp.	Harris Seybold Co.	Scintilla Magneto
Continental Motors	Homelite Corp.	Steel Products Eng.
Curtiss-Wright	Int. Harvester Co.	Studebaker-Packard
Dana Corporation	Jacobs Mfg.	Sylvania (Atomic Div.)
Detroit Transmission		United Airlines
Douglas Aircraft		Warner Gear Div.

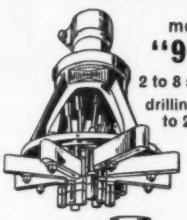
SEND FOR BULLETIN 50 →

COMTOR COMPANY, 82 Farwell St., Waltham 54, Mass.

COMTORPLUG

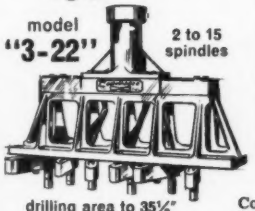
CIRCLE INFORM-A-GRAM KEY NO. 1051

For LOW COST Hole Production Pick a MULTI-DRILL® to Fit the Job

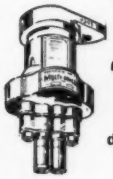


model "900" 2 to 8 spindles drilling area to 22½"

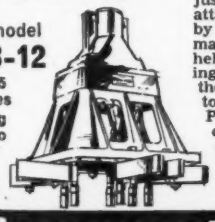
model "500" 2 to 6 spindles drilling area to 18½"



model "3-22" 2 to 15 spindles drilling area to 35½"



model "400" 2, 3 or 4 spindles drilling area 3¾"



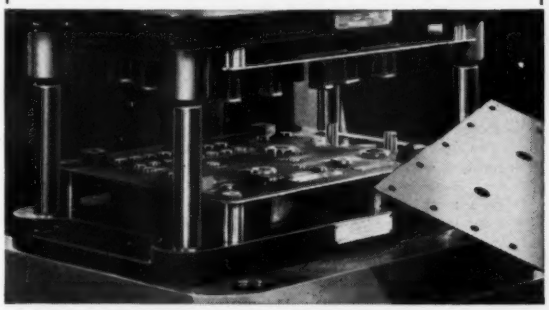
model "8-12" 2 to 15 spindles drilling area to 25½" x 21½"

Commander MULTI-DRILLS—adjustable multiple spindle drill press attachments—are sold and serviced by a nation-wide network of Commander Distributors—experienced, helpful specialists in solving drilling and tapping problems. Write for the name of your nearest Distributor and the complete Commander Production Tool Catalog which contains full details on every MULTI-DRILL and many other production drilling and tapping tools.

Commander MFG. CO.
4228 W. Kinzie Street · Chicago 24, Illinois

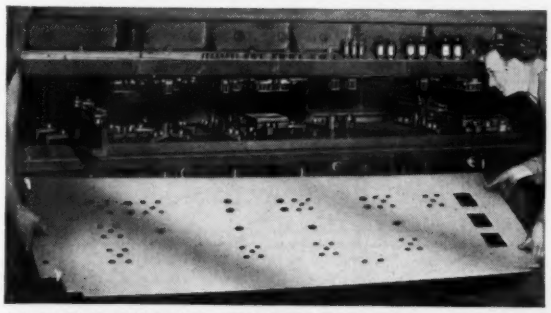
CIRCLE INFORM-A-GRAM KEY NO. 1052

OVER 2700 PLANTS are saving money with WHISTLER DIES



MAGNETIC PERFORATING DIES

All parts reusable and interchangeable. Punches and dies stocked in .001" increments from .100" thru .500" dia. Larger sizes available.



ADJUSTABLE PERFORATING DIES

All parts reusable and interchangeable. Punches and dies stocked in .001" increments from .100" thru .500" dia. Larger sizes available.

manufacturer of all types of CUSTOM DIES for over 40 years

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748 Military Rd., Buffalo 23, N. Y.

Mail the following: ☐ Magna-Die Catalog ☐ Adjustable Die Catalog ☐ More information on custom die work

NAME _____ TITLE _____

COMPANY _____

STREET _____

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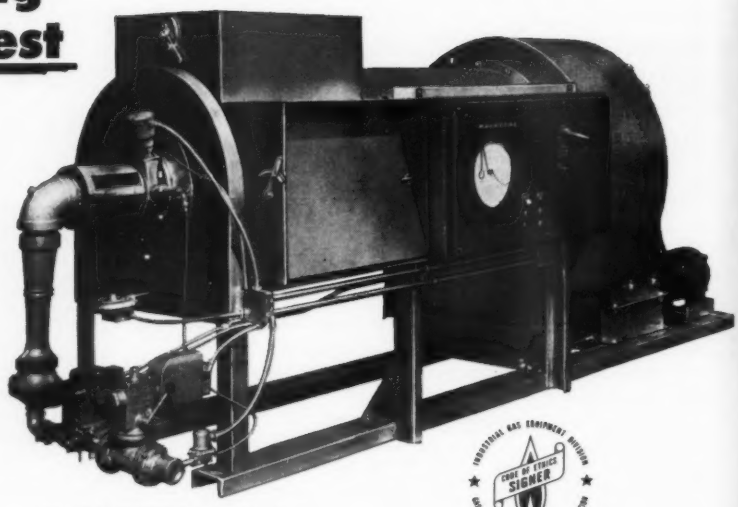
CIRCLE INFORM-A-GRAM KEY NO. 1053

Heat Processing with NEW G. A. S. UTILITY AIR HEATER at its best

A complete package unit, modern as tomorrow in both design and performance, this new direct gas-fired line of industrial heaters comes to you complete with control cabinet, temperature and safety instruments, fan and motor, wired for immediate operation. Can be furnished for remote control wiring. Capacities range from 125,000 BTU's/hr., to 4,000,000 BTU's/hr.,—temperatures to 600°F. in standard models and to 1,000°F., in famous G.A.S. Rapidry Models. Features injector type atmospheric type burners (combination gas-oil burners when desired), heavy-duty industrial type blower, and electrical ignition. Exceptionally quiet operation.



Model 409H illustrated.
Capacity 2,000,000 BTU's/hr.
Complete with controls.

Request complete information.

GAS APPLIANCE SERVICE, INC.
Heat Process Engineers
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Representatives in Major Industrial Areas

CIRCLE INFORM-A-GRAM KEY NO. 1061

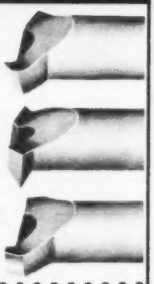
I've learned from experience... I always insist on

Comet® BORING TOOLS

(H. S. S. and Carbide) for Holes from 1/16" upward

STANDARD AND SPECIAL BORING, FACING & INTERNAL THREADING TOOLS. *Write for Data*

Bore Small Holes? Contact COMET



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Comet® LOW COST

High Speed Steel STEP DRILLS

Made to Your Own Specifications - PROMPT SERVICE

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738-TP4 BROADWAY • NEW YORK 3, N.Y.

CIRCLE INFORM-A-GRAM KEY NO. 1062

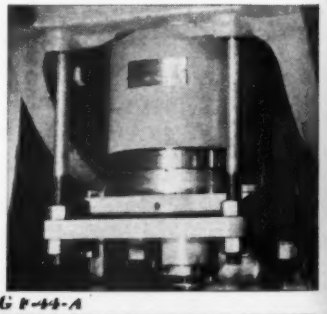
DIE CUSHIONS

by Dayton Rogers

FOR ALL PUNCH PRESSES

to assure accurate working pressure on all dies

- Single installations from 1 ton to multiple installations of unlimited capacity, standard or designed on the job.
- Quotations on request.
- Best possible delivery.



11 Ton Full Universal Pneumatic Die Cushion Installed on inclinable→ Press.

WRITE FOR CATALOG P-44-A

DAYTON ROGERS *Manufacturing Company*

MINNEAPOLIS 7B, MINNESOTA

CIRCLE INFORM-A-GRAM KEY NO. 1063

Machining

Any Angle from 1° to 90° can be ground with this pin-type magnetic angle block set. Can be used on any magnetic chuck and turned

to any angle from the backrail for compound angles. Glover Mfg. Co., 422 Park Ave., Meadville, Pa., or Circle Inform-A-Gram No. K15.

Automation Equipment, components, and standard and special machines are described in a catalog that gives specifications, dimensional drawings, and operational data on this equipment. Machinery for drilling, reaming, tapping, spot facing, and boring is included. Michigan Special Machine Co., 11449 Timken Ave., Warren, Mich., supplies copies or Circle Inform-A-Gram No. K16.

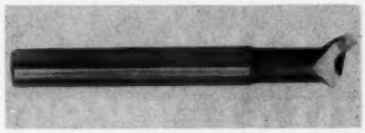
This Tiny Drill is manufactured to a 0.0135" dia for precision drilling nonferrous and other abrasive materials. Highly wear resistant, it produces hundreds of holes without size variations. Super Tool Co., 21650 Hoover Rd., Detroit 13, or Circle No. K17.

Band Machine Users can cut directly to dimensions with this fixture that speeds up band machining and improves accuracy by reducing the amount of layout, cut-and-try techniques, and clean-up stock required. Sliding head may be quickly

locked any place along the calibrated scale and cuts made directly to desired dimensions. The DoAll Co., Des Plaines, Ill., or Circle Inform-A-Gram No. K18.

For Small Precision Drilling, tapping, milling, sawing and grinding operations use this neat compact, low cost coolant unit. Type J. Trico-Mist increases production and lengthens tool life. Equipped with 2' Neoprene coolant line and mist generating nozzle. Trico Fuse Mfg. Co., 2948 N. 5th St., Milwaukee 12, or Circle Inform-A-Gram No. K19.

A New Form-Relief Boring Cutter Line provides increased cutting feeds, longer tool life, and finer surface finish. They come in both high-speed steel and carbide-tipped.



Used for internal work, they provide a constant clearance angle throughout the life of the tool. Maxwell Industries, Inc., 493 East 5th Ave., Ashtabula, Ohio, or Circle Inform-A-Gram No. K20.

Galvanize with Z.R.C.® to stop RUST

ANY SURFACE • ANY SIZE • ANYWHERE

Brush or spray Z.R.C. on any iron, steel or aluminum surface and you will get instant galvanic protection that lasts for years.

Z.R.C. is a free-flowing compound easy to apply without special mixing or surface preparation; dries quickly and forms a tough, flexible, firmly adherent coating of 95% pure zinc. Z.R.C. comes in a single container and is a one-coat application. WILL WITHSTAND OVER 3000 HOURS OF SALT SPRAY TESTING! Cost—about 1½¢ to 2¢ sq. ft.

PRODUCTION—Z.R.C. makes galvanizing an "in plant" operation, eliminates handling, shipping—cuts expense up to 75%.

MAINTENANCE—Use Z.R.C. instead of paint. Get years of protection and greatly reduce annual labor costs.

For full details . . . . .

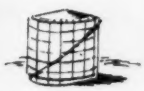
the SEALUBE company

9 VALLEY STREET WAKEFIELD, MASS.

CIRCLE INFORM-A-GRAM KEY NO. 107

AIR CONDITIONING UNITS

SHIPS AND MARINE INSTALLATIONS



TOWERS, TANKS, BRIDGES, ETC.

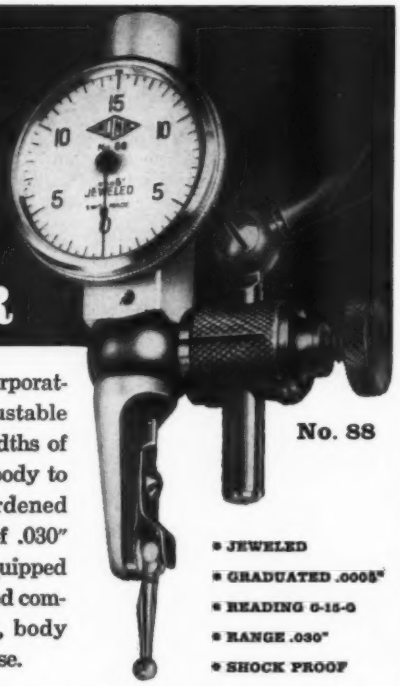
TRUCK CHASSIS AND BODY

PLANT AND FACILITIES

FOOD PROCESSING

AGRICULTURAL AND CONSTRUCTION EQUIPMENT

ALINA DIAL TEST INDICATOR



A fully reversible indicator incorporating a clear easy-to-read, adjustable dial, graduated in half thousandths of an inch, a switch lever on the body to reverse action and TWO hardened chrome plated contact points of .030" and .100" diameter that are equipped with a non-slip ratchet. Furnished complete with a universal shank, body clamp, and plush lined steel case.

No. 88

- JEWELED
- GRADUATED .0005"
- READING 0-15-0
- RANGE .030"
- SHOCK PROOF

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ALINA CORPORATION

122 East Second St., Mineola, L.I., N.Y.

CIRCLE INFORM-A-GRAM KEY NO. 1081

MORE HEAT TREATING VOLUME

with BASIC "BUZZER PACKAGE"

NO BLOWER OR OTHER POWER NEEDED

. . . just connect to gas supply

"BUZZER" modern gas-fired heat treating and melting units give you the most dependable, economical and productive system for turning out quality jobs at low productions costs. When power is off—"BUZZER" stays on the job! Standard and special furnaces, large or small, available to equip your shop to exact requirements.

COMPLETE LINE OF BUZZER REG. U.S. PAT. OFFICE BURNERS FOR CLEANING, RINSING, PICKLING AND SUNDRY HEAT OPERATIONS

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CHARLES A. HONES, INC.

HEAT TREATING EQUIPMENT SPECIALISTS SINCE 1911

153 S. Grand Avenue, Baldwin, L. I., N. Y. • BAldwin 3-1110

CIRCLE INFORM-A-GRAM KEY NO. 1082

Machining

"Synchro-Trace for Milling Applications" gives a complete rundown on this 3-dimensional duplicating system. Features, applications, operational data, and optional controls are detailed. Get this comprehensive bulletin from True-Trace Sales Corp., 9832 Rush St., El Monte, Calif., or Circle No. K21.

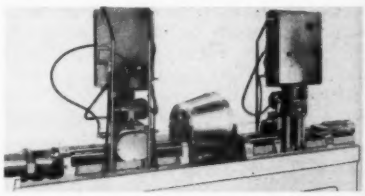
"End Wasteful Cutting Oil Dilution with Cleartex Oils in Automatic Screw Machines" explains what the different grades of oils do and how they can make machining more efficient. Contact The Texas Co., 135 E. 42nd St., New York 17, for a copy, or Circle Inform-A-Gram No. K22.

Short-Length Heavy-Duty Power Drills feature heavy web construction which enables them to withstand considerable strain and drill successfully where full length drills may fail. Suitable for use in portable

electric drills and for drilling sheet metals and hard materials like stainless steel and monel metal. Whitman & Barnes, Plymouth, Mich., or Circle No. K23.

Nut Running Tools, impact and power sockets, extensions, adapters, and universal wrenches are listed in a 48-page catalog that gives complete specifications and dimensional drawings for all types of these tools. Catalog 30-B is supplied by The Apex Machine & Tool Co., 1025 S. Patterson Blvd., Dayton 2, Ohio, or Circle Inform-A-Gram No. K24.

A New Drill Unit was designed for continuous high accuracy deep hole drilling of small (3/32" to 5/8") diameter blind or through holes. Model 2400-A features positive synchronization of spindle speeds and



drills up to 24" depth. 20th Century Machine Co., 6070 E. 18 Mile Rd., Utica, Mich., or Circle Inform-A-Gram No. K25.

Adjustable Drill Fixtures for center line and cross hole drilling, and double center line and double cross hole drilling, are described in a bulletin. Dimensions and features are given for five models. Write to Ace Drill Bushing Co., New Products Div'n, 5407 Fountain Ave., Los Angeles 29, or Circle Inform-A-Gram No. K26.

SAVE 50%
or more in
CONTOUR GRINDING COSTS with Micromaster

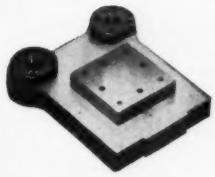
VISUAL GRIND

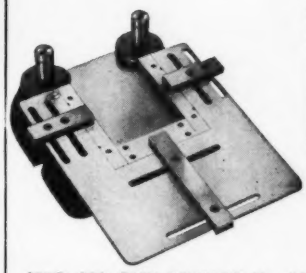
Sold by
Brown & Sharpe Mfg. Co.
Providence, Rhode Island

Visual Grind is manufactured by
The CLEVELAND GRINDING MACHINE Co.
1730 EDDY ROAD • CLEVELAND 12, OHIO
CIRCLE INFORM-A-GRAM KEY NO. 1091

Punches and Dies
Notching Die with Gauge Table

MHL





Standard stock sizes 4", 5" and 6". Lick those Notching Problems QUICKLY. Gauge table and gauging bars provide accuracy and speed with easy adjustment.

This is another of the many different kinds of punches and dies in stock or made to order for foot, hand or power operation. Precision made from high grade tool steel. Also adaptors and die shoes to convert your press.

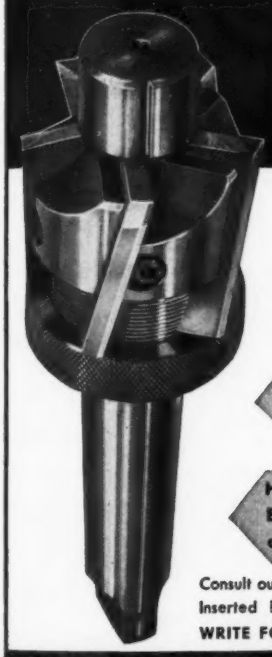
27 *years of serving your punch and die requirements.*

What are your punch and die needs? Consult us about your problems. Prompt service on "Specials" made to your order.

SEND FOR FREE CATALOG No. 157 AF, illustrating our standard punches and dies and complete line of modern sheet metal fabricating equipment. Net prices shown.

WARD Machinery Co. 564 West Washington Chicago 6
CIRCLE INFORM-A-GRAM KEY NO. 1093

INSERTED BLADE GENESEE FACING AND COUNTERBORING TOOLS



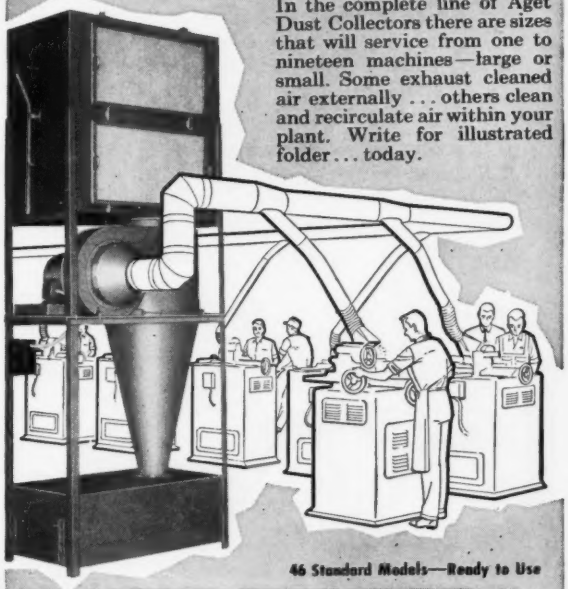
- Interchangeable Pilots
- Constant Chip Space Throughout Life of Blades
- Standard Sizes 1¼ to 4 Standard with Straight or Morse Taper Shanks
- H.S.S.—Carbide Tipped Blades. Save 25% or more over cost of Solid Tools

Consult our Engineering Department on your Inserted Blade Production Tool Problems.
WRITE FOR CATALOG 54P

GENESEE MANUFACTURING COMPANY
566 HOLLENBECK ST. • ROCHESTER 21, N. Y.
Adjustable Hollow Mills • Facing and Counterboring Tools • Special Production Tools • Since 1908
CIRCLE INFORM-A-GRAM KEY NO. 1092

just **ONE** DUSTKOP STOPS DUST
heavy duty unit services up to **19 MACHINES**

In the complete line of Aget Dust Collectors there are sizes that will service from one to nineteen machines—large or small. Some exhaust cleaned air externally . . . others clean and recirculate air within your plant. Write for illustrated folder . . . today.

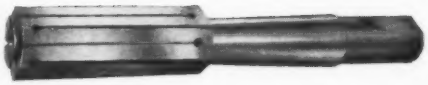


46 Standard Models—Ready to Use

AGET manufacturing company
1394 Church Street • Adrian, Michigan
CIRCLE INFORM-A-GRAM KEY NO. 1094

SPECIAL

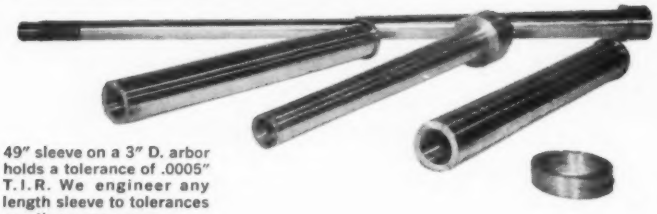
Hex sleeve on a precision arbor. One of many examples of special precision mandrels designed for polygon, tapered bore, and odd shaped holes. Tolerances of .0002" T.I.R. are generally possible.



EXPANDING

⅛" to ¾" O.D. Aircraft parts production required .0001" T.I.R. on these. One has a threaded nut on arbor to release sleeve in dead-end holes.

MANDRELS



49" sleeve on a 3" D. arbor holds a tolerance of .0005" T.I.R. We engineer any length sleeve to tolerances meeting your specs.

CHAMPION®

Special Mandrels—Heat treated and hardened for proper spring temper, precision ground, available from ⅛" to 15" O.D. Precision of .0002" T.I.R. usually specified. Used between centers, chucked, face plate mounted or rotary table mounted on lathes, grinders and milling machines for inspection and production work.

With over 60 years of experience we have the engineering and tooling to produce a Champion that meets your requirements exactly.

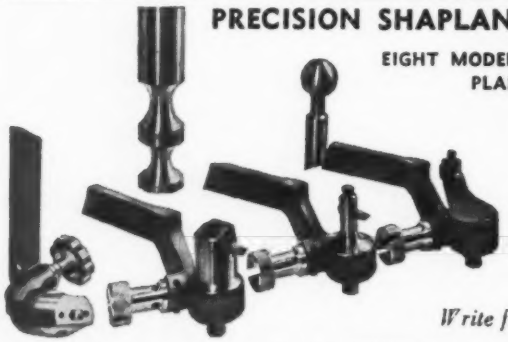
Call or write for complete catalog. **Springfield, Ohio • FAirfax 3-9151**

THE **WESTERN TOOL** & MFG. CO.

CIRCLE INFORM-A-GRAM KEY NO. 1101

PRECISION SHAPLANE RADIUS TOOLS

EIGHT MODELS FOR LATHES, SHAPERS, PLANERS AND BORING MILLS



Range: ⅜" to 3" for concave radii on lathes. Two sizes for convex radii (Balls up to 2½" dia.) on lathes. Also heavy duty model for radii to 6" on planers, etc.

Write for circular

Patent Pending

C. B. TEETER - Tool Room Specialties

3443 N. Greenview Ave., Chicago 13, Illinois • Phone DRexel 3-3571

CIRCLE INFORM-A-GRAM KEY NO. 1102

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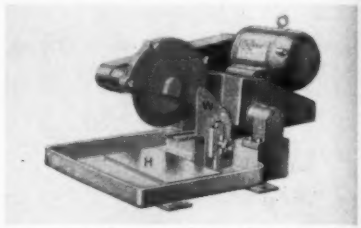

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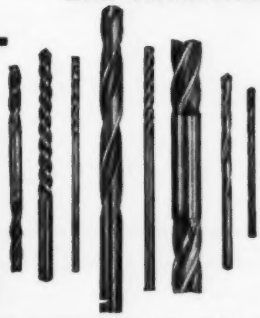

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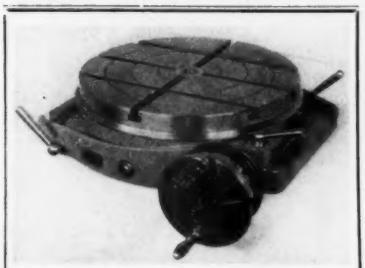

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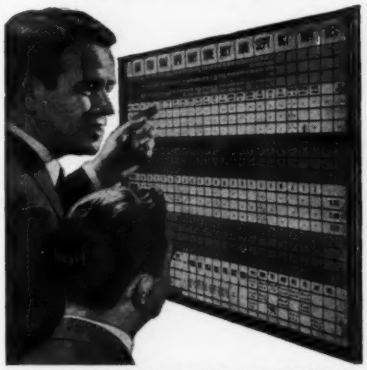

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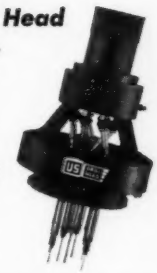

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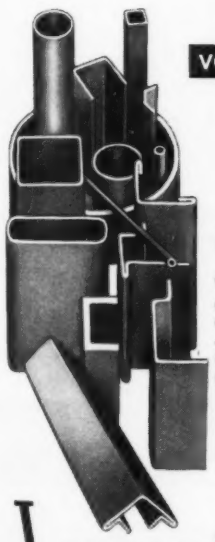

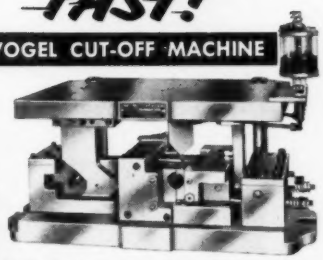

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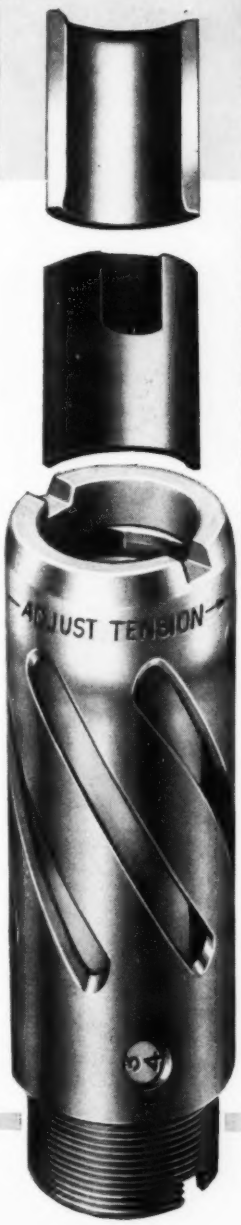

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